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*Illustrated.

George E. McCaughan, claims attorney of the Rock Island, who has lectured in the Chicago common schools on "Safety-First," and who in other ways has participated in the movements in that city for the promotion of safety, recommends that this subject be made a part of the regular curriculum of all schools. Occasional lectures or meetings are not enough. There should be regular instructions. He suggests also that those railroad companies which, like the New York Central and the Rock Island, have motion-picture outfits, could do a good thing by lending these to schools in those cities where the city officers encourage such instruction. No argument is needed, of course, to convince anyone of the desirability of educating children in guarding against the dangers of the road, the railroad and the playground. Habits are formed in childhood. Many a child's playground can best be described as "everywhere," including railroad yards and tracks. The railroad officer who already has to spend half his time in doing things—believed to be in large measure unnecessary—which are required by the Interstate Commerce Commission, may not relish the suggestion that he go still further out of his immediate field; and emulate Mr. McCaughan in spending his mornings or evenings in school houses. Railway men are, indeed, branching out in directions which a few years ago were unheard of, but the superintendent who, like an ornamental mayor or governor should spend his whole time in making speeches would misuse his position. Nevertheless, there is, here, no doubt a field. Cultivation of the school children has been tried in other places. It is not wholly a new thing.

Our attention has been called to a series of developments in the Second Congressional district of Oregon which indicate that even in that state of radical ideas and

Government Ownership in Oregon

radical legislation the people are not disposed to look with favor on politicians who advocate government ownership of railways. The present representative of

the Second Oregon district is A. W. Lafferty. Last spring the Hon. Lafferty arose in his place in Congress and made, or at least secured leave to print, a speech advocating government ownership of railways. In support of his thesis he presented the hackneyed arguments and a large number of statistics and alleged facts which, apparently, were derived chiefly from a book written some years ago by one Anthony Van Wagenen of Sioux City, Iowa. In this book Mr. Van Wagenen advocated government ownership of railroads in a way which showed that he probably knew as little about the subject as any man living. It would appear that after making his speech Mr. Lafferty was defeated for renomination by the Republicans, who had originally elected him. At any rate, on October 2 he again arose in his place and referred in very uncomplimentary terms to a speech against government ownership which, he said, had been delivered by C. N. McArthur, the Republican candidate for Congress from the Second Oregon district, before the Portland Transportation Club. Thereupon Mr. Lafferty had both his original speech and Mr. McArthur's speech in reply embalmed in the Congressional Record. Now, in view of the fact that Oregon is the real birthplace of the initiative, the referendum and the recall in this country, one would naturally think that it would be as safe a place for a candidate for Congress to advocate government ownership and as unsafe a place to oppose it as anywhere in the United States. Nevertheless, we note by the election returns that C. N. McArthur, Republican, has defeated A. W. Lafferty, Independent, for re-election to Congress from the Second Oregon district. Evidently the people of that state are not as yet more prepared to accept the gospel of government ownership of railways than the people of the United States showed themselves to be when William Jennings Bryan made his famous speech on this subject at Madison Square Garden some years

ago. If the people of radical Oregon reject this gospel, how must we think that the people of the rest of the country would deal with it?

SUPERHEATERS ON SMALL LOCOMOTIVES

IN order to realize the greatest benefit from the economies which obtain in the use of superheaters, applications to existing locomotives have for the most part been confined to the larger classes of power which are, of course, the greatest money earners. The value of the superheater is now so well recognized that large numbers of the heavier types of locomotives which were originally built as saturated steam engines have had superheaters applied while passing through the shops, and others are undergoing the same change as rapidly as arrangements can be made to accomplish it. However, as yet little has been done toward the application of superheaters to what were the large locomotives of a few years ago, and which are now, for the most part, relegated to branch line and local main line service.

This is a problem which should, of course, be considered strictly from a business standpoint and it is not intended to suggest that the railways should apply superheaters to all existing locomotives, no matter how small or in what condition they may be, although in at least one case locomotives that would otherwise have to be discarded are being reclaimed by the expenditure of a comparatively small sum in the application of superheaters and allied changes, in such a manner as to make them serviceable for many years on branch lines. But the locomotives which would seem to hold out the greatest immediate possibility of economy by conversion from saturated to superheated steam are those of the Atlantic, Ten-wheel and Eight-wheel types in passenger service, and the Consolidation, Ten-wheel and Mogul types in freight service, built within the last 15 or 20 years. Many of these engines are already equipped with piston valves, a factor of considerable saving in making the change, as the slide valve cannot as yet be said to work satisfactorily with superheated steam. There are passenger trains now being hauled by Pacific type locomotives on schedules which could be successfully maintained by Ten-wheel or Atlantic type locomotives if given the increased boiler capacity which the superheater provides, and trains now operating on schedules which tax the capacity of engines of the two latter types to the utmost could then without difficulty undergo an increase in the number of cars or in the weight of the equipment. In this connection the increased weight of cars is a consideration which should not be overlooked. The general introduction on the main lines of most of the railways of steel equipment for passenger service has resulted in a great many cases in heavy wooden coaches being displaced for use on local and branch line passenger trains; indeed in some instances, steel underframe and all-steel passenger cars are in every-day use on such trains as well as on the heavier through trains. The use of this heavy equipment frequently presses the smaller saturated steam locomotives to the limit, and it becomes difficult or impossible for them to make up lost time or to get over the road on the schedule when it becomes necessary to add a car or two. The addition of superheaters to locomotives of the types mentioned increases their capacity so that they can successfully haul trains which otherwise they would be unable to handle and which, on the other hand, would not justify, from the standpoint of needed capacity, the employment of locomotives of the larger types.

Another opportunity for utilizing the economy of superheated steam is to be found on roads or divisions where the purchase of heavier motive power in order to increase trainloads will necessitate heavy expenditures for increasing the track and bridge capacity. In such cases the application of superheaters to existing engines will increase their hauling capacity and thus postpone the time when an increase in the weight of rails and the strength of bridges becomes necessary. Altogether it would seem that there must be large numbers of locomotives of these smaller types, on which the expenditure required to change them for the use of superheated steam would be amply justified by the economy afterward obtainable.

SPECIAL CHARGES FOR SPECIAL SERVICES AT CHICAGO

THE traffic and terminal situation at Chicago is, for various reasons, the most complex in the world. In the hearing of the 5 per cent rate case the Interstate Commerce Commission animadverted on the practice which has grown up at many places of the railways rendering certain services for nothing, or paying others for rendering certain services, the effect of which is to give many shippers store door delivery. The Commission intimated that the roads should impose special charges for the so-called "spotting" of cars and should discontinue arrangements under which some shippers are given what amounts to store door delivery while most shippers are not given such delivery.

The views expressed by the Commission applied with special force to the situation at Chicago. The railways centering there have now filed tariffs intended to carry out the policy which they understand to have been recommended by the Commission. The Chicago Association of Commerce and the National Industrial Traffic League are opposing this action. The situation at Chicago is so important, and at the same time raises so many questions which also come up at other large terminal points, that it merits special discussion.

The *Railway Age Gazette* from the first opposed the plan for making special a charge for merely placing freight cars on private sidings. We did so because this service is merely a substitute for another railway service, that of placing cars on team tracks, and is preferable from the standpoints both of the carrier and the shipper, in many cases, to placing cars on team tracks. At the same time this paper took the view that when the railway renders some service in addition to that of merely placing cars at a convenient point on the shipper's siding, such as that of moving them about within the shipper's plant, and spotting them for him, an additional charge should be made. The reason why this should be done is that the additional service is not a substitute for some ordinary railway service, such as that of placing cars on a team track, but is a substitute for a service which should be performed by the shipper himself, namely, that of teaming the freight.

Now, the railways at Chicago have been rendering the so-called trap car service for nothing. This is the service of placing a car at an industry to be loaded with less-than-carload freight and moving it to a freight station for the subsequent handling of the contents in the same way in which less than carload freight is handled after it has been delivered at the station by a team and truck. There is under the business district of Chicago a tunnel in which an electric freight railway is operated by a company known as the Chicago Warehouse & Terminal Company, and there is also a lighterage company operating on the river called the Merchants' Lighterage Company. These concerns haul freight between industries and their own stations and the railway stations. Some years ago some of the railways began applying the regular Chicago rates not only to and from their own stations and terminals, but also to and from points of origin and destination reached by the Chicago Warehouse & Terminal Company and the Merchants' Lighterage Company and to pay these companies allowances for the services which the latter render. It is now proposed by the railways to impose an extra charge for the trap car service, and to cease paying allowances to the Merchants' Lighterage Company and the Chicago Warehouse & Terminal Company, thereby making the Chicago rates apply only to the railways' own terminals and stations.

Now, what are the trap car service, the tunnel service and the lighterage service, fundamentally? Are they, like the service of placing a car at a convenient point on a shipper's siding, merely substitutes for some ordinary railway service? Clearly not. Obviously, they are services substituted for the service of handling freight between the stations of the railways and other points in the city by teams and trucks. How true this is, is indicated by the fact that the lighterage service was established on the Chicago river originally to move freight to and from the railway stations when, owing to a teamsters' strike, sufficient teams and trucks for this purpose were not available. In effect, then, by rendering the trap car service free, and by paying for the tunnel and light-

erage services, the railways of Chicago are doing the *equivalent* of teaming freight for nothing to and from their freight stations for those shippers of Chicago to whom the trap car, tunnel and lighterage services are rendered.

Now, the railways do not render the tunnel and lighterage services to shippers in other cities than Chicago, because in other cities such tunnel and lighterage facilities do not exist. In consequence, the payment by the railways for these special services in Chicago operates as a discrimination in favor of the benefited shippers in Chicago and against the shippers of other and competing cities. Furthermore, in other cities most of the shippers are not so situated that they can take advantage of the trap car service. Therefore, when it is rendered free it operates as a discrimination in favor of those shippers who receive it and against those who are obliged to deliver their freight to the railways by trucks and bear the expense of doing so. Finally, in Chicago there are many shippers who are unable to take advantage of the trap car, the tunnel or the lighterage service, but who must truck their freight to the railways; and therefore the rendering by the railways of these services free to the shippers who receive them operates as a discrimination in favor of them and against the rest of the shippers. In other words, not only do the railways by rendering the trap car service free, and by bearing the expense of the tunnel and lighterage services, render services additional to the ordinary railway service for which they receive no compensation, but they also discriminate in favor of some shippers and against other shippers.

Is there any justification for the railways continuing these practices? There does not appear to be any more justification for them rendering at their own expense services which are clearly substitutes for the teaming of freight than there would be for them bearing the expense of providing teams and trucks to haul freight to and from their stations. It is said that the trap car service saves the railways money, and is therefore of benefit to them as well as the shippers. But if we may assume that the shippers know what is best for them, why may we not also assume that the railway managers know what is best for the railways? Why all this solicitude on the part of the shippers for the welfare of the railways?

Again, it is said that if a special charge is made for the trap car service and the allowances for the tunnel and lighterage services are discontinued, the freight now moved in trap cars and by the tunnel and lighters will be transferred to trucks, and in consequence the present congestion of the streets of Chicago will be greatly aggravated. It is to be presumed that any charge which may be permitted by the Interstate Commerce Commission to be made for the trap car service will be reasonable; in other words, will only cover the cost of the service and perhaps a reasonable profit. A reasonable charge may be less than the cost of teaming the freight. If it is, how can it be assumed that the shippers would choose to incur the greater expense of teaming their freight in preference to the smaller expense of using the trap car service? On the other hand, if a reasonable charge for the trap car service would be greater than the expense of teaming the freight, why should the railways be expected to incur the greater expense of handling the freight by trap car rather than the smaller expense of handling it by team? On the assumption that a reasonable charge for the trap car service would exceed the cost of handling the freight through the streets in trucks, it would be better for the railways themselves to pay the cost of teaming rather than to render the trap car service for nothing.

Likewise, if the railways discontinue paying allowances to the tunnel and lighterage companies shippers subsequently will either find it less or more expensive to have their freight handled by the lighters and the tunnel than by team. If they find it cheaper to handle it by team it is hardly to be expected that they will quit sending it by tunnel and lighter. On the other hand, if it would be cheaper for the shippers to handle the freight by team than by tunnel and lighter, then obviously it would also be cheaper for the railways to bear the cost of having the freight teamed than to bear the cost of having it handled by tunnel and lighter, and on

that assumption the railways are now losing money by paying for having the freight handled by tunnel and lighter rather than by teams.

The argument of the shippers that if the railways make a reasonable charge for trap cars and discontinue paying allowances to the tunnel and lighterage companies the freight now handled by them will be transferred to the streets is simply an argument that it is cheaper for whoever foots the bill to have the freight handled by team, and if that argument is valid, then the way in which the freight is now being handled in Chicago involves heavy economic waste and the trap car, lighterage and tunnel services ought to be totally abolished in order to stop this waste. Certainly, that line of reasoning is not persuasive when used to show that the present arrangements should be continued.

It may be contended, however, that while they do result in economic waste they should be continued because it is better that there should be such economic waste than that the streets of Chicago should be further congested. But if it is so desirable that the streets of Chicago should not be congested, why should the railways be required or expected to bear the cost of preventing them from being congested? If economic waste is to be incurred in order to keep the streets of Chicago from being congested, why should not the people of Chicago, or the shippers of Chicago, foot the bill rather than the railways? When did it become a function of railways to render services at a loss in order to relieve congestion of the streets of a city? Evidently, if they do incur loss in this way somebody must foot the bill. Who is that somebody to be? Evidently either the stockholders of the railways or the passengers and shippers of other communities. But to say that the stockholders of the twenty-seven railways entering Chicago or the passengers and shippers of other communities should bear the expense of preventing congestion in the streets of Chicago, rather than the people and shippers of Chicago themselves, is absurd.

We reach, then, the conclusions (1) that the trap car, lighterage and tunnel services in Chicago are services additional to the ordinary transportation services; (2) that when the railways render or pay for these services without charging those to whom they are rendered anything for them, they discriminate against all communities in which and against all shippers to whom similar services are not rendered on the same basis; and (3) that the argument that the present arrangement should be continued in order to prevent congestion of the streets of Chicago is the height of absurdity. It is quite possible that in the tariffs which the railways have been preparing and filing for the changing or abolishing of these arrangements there are injustices. But these can be remedied. As to the proposition that the railways should not continue to render the trap car services free or to pay allowances to the tunnel and lighterage companies, that proposition cannot be controverted on any other or better ground than can the proposition that rebating ought not to have been abolished and ought now to be revived; for the fact is that the present trap car, tunnel and lighterage arrangements in Chicago are merely devices to give rebates.

ILLINOIS CENTRAL AND LOUISVILLE & NASHVILLE

THE Illinois Central was a Harriman road as long as that term was applicable. There is, of course, now no such thing as a Harriman road; but the traditions, organization, viewpoint and ideals of the Illinois Central may still be called, without violating the Sherman anti-trust law, characteristic of the Harriman system. The Louisville & Nashville is a Walters road.

The Illinois Central and the Louisville & Nashville are very nearly the same length—the Illinois Central, 4,769 miles; the Louisville & Nashville, 4,938 miles. To some extent the two roads are competitive; to some extent they are comparable in physical condition, nature of traffic, etc.; in other respects they are quite unlike. It is interesting, even if no definite conclusions can be reached, to compare and contrast operating and traffic conditions and to attempt to analyze, even if in a very general

way, differences in the operation of the properties that may fairly and properly be attributed to differences in policy of the owners.

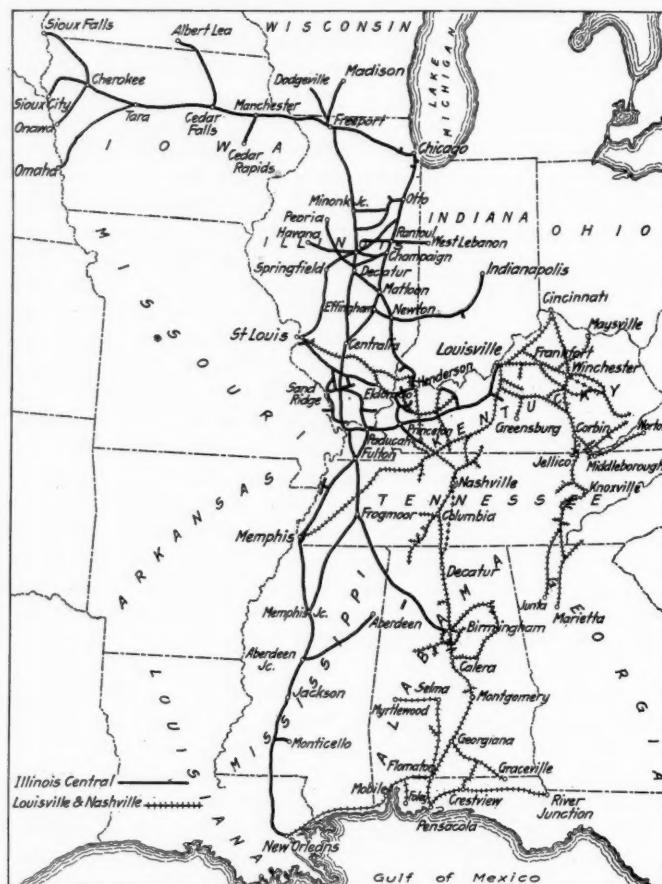
The roads are so nearly alike in length of mileage that it is not necessary to reduce earnings and expenses to a per-mile basis. The Illinois Central in the fiscal year ended June 30, 1914, operated an average of 4,769 miles, almost the same as in the previous year. The Louisville & Nashville operated 4,937 miles of road, an increase of a little over 100 miles as compared with the previous year. The principal cities which are served by both the Illinois Central and the Louisville & Nashville are St. Louis, Memphis, New Orleans, Birmingham and Louisville. The map shows the quite striking difference in topography of the two roads. The Illinois Central consists of a main line from Chicago to New Orleans, with an important branch to Birmingham and branches tapping Indianapolis and Louisville. The line running west from Chicago to Omaha and Sioux Falls is of secondary importance; in other words, the Illinois Central is largely main line. The Louisville & Nashville, lying east of the Mississippi valley, connects the important industrial centers of the middle west and southeast. It has, furthermore, a large percentage of branch line mileage.

The character of traffic and characteristics of traffic statistics reflect this difference in location and topography. The average length of haul of freight on the Illinois Central was 241 miles in 1914 and 171 miles on the Louisville & Nashville. The average length of passenger journey on the Illinois Central was 26 miles; on the Louisville & Nashville, 43 miles. The Illinois Central's very large commutation business into Chicago is an important factor in explaining the difference in the average passenger journey. The difference in the location of the roads explains the difference in length of haul. The earnings per ton per mile on the Illinois Central were 5.63 mills in 1914; on the Louisville & Nashville, 7.78 mills. The earnings per passenger per mile on the Illinois Central were 1.908 cents, in the Louisville & Nashville, 2.266 cents.

The Louisville & Nashville does not include in its report to stockholders a table showing classification of tonnage; but from its report to the Interstate Commerce Commission it is possible to make a comparison with the Illinois Central which, like most other roads, includes such a statement in its report to stockholders. Of the total 32,215,000 tons of freight carried in 1914 by the Louisville & Nashville, 36.97 per cent was furnished by bituminous coal, the total coal tonnage in 1914 being 11,910,000, comparing with 11,369,000 tons in 1913. Of the total tonnage of 32,343,000 tons carried by the Illinois Central in 1914, 37.55 per cent was bituminous coal, the total coal tonnage being 12,146,000 tons, comparing with 10,489,000 tons in 1913. Besides its coal tonnage the Louisville & Nashville has a very large tonnage of ores, 4,185,000 in 1914, or 13.18 per cent of its total tonnage. The tonnage of ores on the Illinois Central is negligible. On the other hand, products of agriculture furnished but 7.55 per cent of the total tonnage on the Louisville & Nashville, and forest products 9.12 per cent, while on the Illinois Central products of agriculture furnished 17.14 per cent and lumber 14.85 per cent. Manufactures furnished 11.83 per cent of the Louisville & Nashville's total tonnage, and but 8.16 per cent of the Illinois Central's.

Before making a comparison of the showing in 1914, and especially of the changes, as compared with 1913, shown by the annual reports of these two roads, emphasis must be laid on their recent history. The Illinois Central was very seriously affected by a strike in the fall of 1911, the effects of which extended through most of the fiscal year ended June 30, 1913. Furthermore, the Illinois Central suffered seriously from the floods in 1913. The Louisville & Nashville suffered much less from the floods in 1913 and had no strike on its hands. The comparison therefore, between 1914 and 1913 on the Louisville & Nashville is a comparison between two comparatively normal years, while this comparison for the Illinois Central is between an abnormal year and a comparatively normal one. By normal is meant a year which for the particular road in question is not unlike the same year for other roads.

In 1914 the Illinois Central had net income available for dividends of \$8,139,000, or \$1,564,000 more than the net in 1913. The Louisville & Nashville had \$7,084,000 in 1914, or \$1,547,000 less than in 1913. The Illinois Central has outstanding \$109,-296,000 common stock on which it now pays 5 per cent dividends, and the Louisville & Nashville has outstanding \$72,000,000 stock on which it pays 7 per cent. The total funded debt of the Illinois Central is \$197,261,000, and of the Louisville & Nashville \$184,463,000. It will be seen, therefore, that the Illinois Central has outstanding considerably larger amounts of capital securities; but, on the other hand, the Illinois Central has an investment of \$48,853,000 in securities of proprietary and affiliated companies, \$42,196,000 advances to these companies, and \$53,215,000 miscellaneous investments, while the Louisville & Nashville has a total of but \$10,483,000 of securities of proprietary and controlled companies, \$18,913,000 advances to these companies, and \$22,-188,000 other investments; so that whereas the Illinois Central's



The Illinois Central and the Louisville & Nashville

outstanding securities exceed the Louisville & Nashville's by \$60,072,000, the Illinois Central's investment other than in its road and equipment exceeds the Louisville & Nashville's by \$82,680,000. The Illinois Central's total income other than from the operation of its railroad was \$7,321,000 in 1914, an increase over the previous year of \$1,321,000. The Louisville & Nashville's other income was \$2,813,000, a decrease of \$224,000; and whereas the Illinois Central's total other investment is nearly three times that of the Louisville & Nashville's, its other income is quite a little less than three times that of the Louisville & Nashville. The Louisville & Nashville's surplus, after the payment of 7 per cent on its stock, of \$1,639,000 as compared with the Illinois Central's \$2,632,000, after paying only 5 per cent on its stock, is in small part explained by the more profitable other investment of the Louisville & Nashville, due largely to its investment in Nashville, Chattanooga & St. Louis, in part by the smaller proportion of its stock to total outstanding securities, and in part to the somewhat larger net earning power of the railroad. The smaller proportion of face value of stock

to total securities, while it concentrates the profit, is a factor of weakness rather than strength, although, of course, it is rather beside the question to talk about weakness in connection with the Louisville & Nashville.

The Illinois Central's railway operating income was \$11,739,000, in 1914, an increase over 1913 of \$489,000, and the Louisville & Nashville's was \$12,325,000, or \$588,000 less than in 1913. Although the Illinois Central's operating income is smaller—about in proportion to its lesser mileage—than the Louisville & Nashville, we would expect to find it considerably larger, so great a proportion of the mileage being main line mileage, with a long freight haul. The table at the end of these remarks shows how nearly alike the two roads are in proportion of revenue from passengers and from freight to total revenue; but it will be remembered that both the ton-mile rate and the passenger-mile rate are very much lower on the Illinois Central than on the Louisville & Nashville. The business handled, therefore, is, of course, much larger on the Central than on the Louisville. The total number of tons of freight carried in 1914 by the Central was 32,343,000, comparing with 30,447,000 in 1913. On the Louisville the total tonnage in 1914 was 32,215,000, and in 1913 32,242,000. With its longer average haul, however, the Central had 7,789,000,000 ton-miles in 1914 as against the Louisville's 5,512,000,000 ton-miles.

The total number of passengers carried by the Central was 27,523,000 in 1914 as against 27,538,000 in 1913. On the Louisville & Nashville it was 13,360,000 in 1914 and 12,928,000 in 1913. The passenger mileage in 1914 on the Central was 719,000,000, and on the Louisville & Nashville 577,000,000.

As would be expected, therefore, transportation expenses on the Illinois Central are higher than on the Louisville & Nashville, \$24,150,000 on the former and \$20,638,000 on the latter in 1914. With 41 per cent more ton mileage and 25 per cent more passenger mileage handled, the Illinois Central's transportation expenses were but 17 per cent more than the Louisville & Nashville's. One reason, presumably for this is the very much larger freight trainload, which on the Illinois Central was 417 tons in 1914, an increase of 10 tons over the previous year, and on the Louisville & Nashville 297 tons in 1914, an increase over the previous year of 2 tons. Of course it is quite impossible to say as to how much of this difference in trainload is due to a difference in traffic conditions and how much to a difference in the stress which is laid by the operating management on the importance of heavy trainloading.

The two roads pursue much the same policy in regard to maintenance, although the Illinois Central in the last two years has held down rather hard on its maintenance of way expenditures. In 1914 the Central spent \$9,206,000 on maintenance of way, and the Louisville \$9,323,000; in 1913 the amounts spent were \$8,519,000 and \$11,033,000 respectively. With such a comparatively small amount of branch line mileage, the Central's policy is not quite as generous compared with the Louisville's as would appear at first glance.

Maintenance of equipment expenditures on the Illinois Central were affected seriously by the strike which was previously mentioned. In 1914, however, all bad effects of the strike had disappeared. In that year the company spent \$14,510,000 for maintenance of equipment as against the Louisville's \$12,240,000. These figures compare with \$13,952,000 for the Central and \$11,217,000 for the Louisville in 1913. The mileage of equipment on the two roads compares as follows:

	I. C.	L. & N.
Revenue freight-train miles	18,395,000	18,004,000
Revenue passenger-train miles	13,180,000	10,649,000
Percentage of empty freight-car mileage	33	31

As to financial condition, the Louisville & Nashville is in funds; the Illinois Central at the end of the year was not. The Louisville & Nashville had on hand on June 30 \$13,816,000 cash, with no loans and bills payable, and total working assets of but \$8,048,000. The Illinois Central had on hand \$10,859,000 cash, but of this \$10,780,000 was due on the following day, July 1, on 4½ per cent notes. There were \$725,000 loans and bills payable,

which, however, was less by \$5,755,000 than loans and bills payable at the beginning of the year, and total working liabilities, exclusive of the 4½ per cent notes just mentioned, but including the bills payable of \$10,200,000. The Illinois Central has in its treasury \$21,666,000 securities of its own, and in addition \$15,718,000 marketable securities. Its very low working capital, therefore, is due not to any lack of liquid assets, but to the bad state of the bond market. The Louisville & Nashville's strong cash position is due to the sale in 1913 of \$12,000,000 stock. During 1914 the Louisville & Nashville sold \$19,592,000 bonds and retired \$1,541,000, leaving a net increase in the debt outstanding in the hands of the public of \$18,051,000. The Illinois Central sold in all \$4,000,000 refunding mortgage bonds and \$3,500,000 equipment trust certificates, \$2,975,000 equipment trust certificates, however, being retired. In 1914 the Illinois Central spent a total of \$11,814,000 on additions and betterments. The Louisville & Nashville spent \$12,036,000 for additions and betterments, including equipment.

The following table shows the principal figures for operation, comparing the two roads in 1914 and in 1913:

	1914		1913	
	I. C.	L. & N.	I. C.	L. & N.
Average mileage operated	4,769	4,938	4,763	4,820
Freight revenue	\$43,871,272	\$42,868,078	\$42,589,299	\$42,924,952
Passenger revenue	13,715,979	13,082,509	13,455,884	12,835,658
Total operating revenue	65,873,700	59,682,778	64,280,903	59,465,699
Maint. of way and structures	9,205,946	9,323,206	8,519,025	11,033,134
Maint. of equipment	14,510,079	12,239,795	13,952,654	11,216,889
Traffic expenses	1,290,778	1,334,264	1,320,583	1,259,702
Transportation expenses	24,150,040	20,638,427	24,743,324	19,884,015
General expenses	1,618,484	1,247,015	1,513,325	1,417,141
Total operating expenses	50,775,327	44,782,708	50,048,912	44,810,880
Taxes	3,341,247	2,600,288	2,903,551	1,761,626
Operating income	11,739,475	12,324,900	11,250,848	12,913,621
Gross income	19,060,075	15,137,877	17,250,200	15,950,725
Net income	8,138,824	7,084,162	6,575,113	8,630,944
Appropriations	*41,643	+405,275	...	250,646
Dividends	5,464,800	5,040,000	6,557,760	4,618,733
Surplus	2,632,381	1,638,887	17,353	3,761,565

*For additions and betterments.

†Sinking fund and doubtful accounts.

NEW BOOKS

Federal Trade Commission Law. Pamphlet, 42 pages, 6 in. by 9 in. Published by W. H. Lowdermilk & Co., 1424 F street, Washington, D. C. Price 50 cents.

This pamphlet contains a digest of the U. S. Federal Trade Commission Act, which was approved September 26, and the text of the anti-trust law and of other acts or parts of acts supplementary to it. There is also given the full text of the latest supplementary act, known as the Clayton bill, which has become a law since this pamphlet was written. The only discussion in the book is that contained in an introduction of ten pages by John B. Daish, a well-known lawyer of Washington.

American Society for Testing Materials 1914 Year Book. Size 6 in. by 9 in., 500 pages, illustrated, bound in cloth. Published by the society, office of secretary-treasurer, University of Pennsylvania, Philadelphia, Pa. Price \$5.

The "Year Book," which is one of the regular publications of the American Society for Testing Materials, contains all of the standard specifications of the society in their latest revised form. Among those of special interest to railway men are the revised specification for rails; splice bars; structural steel for bridges; structural steel for locomotives; concrete reinforcing bars; axles, shafts and forgings for locomotives and cars; tires and locomotive cylinders, and the new specifications adopted at the last convention for cars, carbon bars for springs, methods of analyses of plain carbon steel and drain tile. In addition to the standard specifications adopted by the society, the book also contains selected specifications from other sources for reference purposes. These include the A. R. E. A. 1914 rail specifications and specifications for Bessemer and open hearth rails by the United States Steel Products Company, dated September 1, 1914. The book also includes the personnel of the technical committees and the regulations governing the work of these committees.

Letters to the Editor

CONNECTICUT CITIZENS MADE POSTHUMOUS CRIMINALS

NEW YORK CITY.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The action of the government in its proceedings relative to the New York, New Haven & Hartford, whether one considers the utterances of the Interstate Commerce Commissioners or the varied moves of the Attorney General, has been characterized by numerous mistakes, which are obvious to all broad-minded railway men who have followed the facts; but the latest proceeding, the prosecution in New York, under which the grand jury was induced to return indictments against 21 men for alleged violations of the anti-trust law, going back to the year 1891, was peculiarly crude and blundering. This long-range firing from Washington, reported in the *Railway Age Gazette* of November 6, page 878, can be seen in its worst aspect only by one who is acquainted with Connecticut affairs and who is able to take a calm perspective over the last 30 years. Let me call your attention to a letter by the Rev. Dr. E. P. Parker, of Hartford, printed in the *Hartford Courant*. He says, in part:

"I have read with gratification the editorial comments of the Springfield Republican on the indictment of directors and former directors of the New York, New Haven & Hartford for criminal conspiracy, with little or no discrimination. Perhaps the just severity of its comments is the more effective for being couched in a guarded form of expression. Some of us, who know several of these indicted gentlemen, find it difficult to refrain from language more charged with indignation."

"With what justice, with what propriety, yea, with what decency, was the list of indicted persons officially published to the world with another sort of black list of the names of [fifty] persons not under indictment, many of whom have been for years sleeping in honored graves? Some of these men thus unnecessarily and, as I think, most indecently blacklisted, I had known for long years. Had Connecticut a man of his day more respected for his flawless integrity than Luzon Morris, of New Haven? Permit me to name three others, personally and intimately known to me, Leverett Brainard, Henry C. Robinson and Col. Frank W. Cheney.

"Whatever mistakes of judgment these men may have made in the course of their lives of public service, no one who knew them, no man of their day in Connecticut, ever doubted their absolute fidelity and integrity. Without the slightest prejudice to others, one may safely say that no man in Connecticut was more in the respect, confidence and honor of his fellow-citizens, no man more completely combined the virtues and the graces of an irreproachable gentleman, than Col. Frank Cheney. Rather than do a known wrong thing, in private or in public business, he would have cut off that arm shattered at the battle of Antietam. And it pleases somebodies, in the misuse of office and power, for motives which may be conjectured, to blacklist such names before the public; to attempt to discredit and dishonor the dead whom they cannot indict, and who can make no protest nor defense! . . . I, for one, wish to speak plainly for my dear dead friends, and to protest against what seems to me a heedless, if not wanton sacrilege. One would rather go to hell with some men than to heaven with others."

One of the fifty names in the list of those not indicted according to law, but, by this publication, indicted before the public by the press agent of the Washington officials, was that of the late J. Pierpont Morgan. Who that has read the facts believes that Mr. Morgan desired or intended either to defy the Attorney General or to rob the New Haven road? With our hindsight, we can say that in buying the New York, Westchester & Boston

and putting that great burden on the New Haven's treasury he made a colossal blunder; but will the courts call that blunder a crime? These prosecutions began with an extremely silly mistake—the indictment of Mellen and Smithers for an alleged agreement not to waste millions of money in building useless railroads to Boston and Providence—and the gentlemen of the Department of Justice have been trying, ever since, to make amends by doing something that would prove to be really in the public interest. Thus far they have had no success. There is no sign of success in the future; and so, presumably, those of the New Haven men who are still living must face a two years' campaign in the courts, like that of the suit against the United States Steel Corporation—two years, or four years, or whatever number of years may be necessary for the government to find some way to let itself down softly.

Chief Justice White, in laying down a "rule of reason," has restored the courts to a position where, it is to be hoped, they can get along with the anti-trust law without killing the business of the country; but who can infuse reason into the Attorney General's department?

R. BLANCHARD.

CHEMICAL SPECIFICATIONS FOR BRAKEBEAMS

FRANKLIN, Pa.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In looking over the report of the American Railway Master Mechanics' Association for 1914, I note that progress has been made in the adoption of chemical specifications for various parts of the locomotives, but fail to find any for brakebeams. If there is any one part of a locomotive or car that demands the highest grade material it is the brakebeam. It is subject to many shocks and strains other than direct pulls, such as the emergency application and the vibrations due to chattering. A broken brakebeam means the loss of braking power on the car or locomotive tender to which it is attached, and this is an important factor in the case of high speed passenger trains; and a broken beam often causes derailments, wrecks and delays.

The chemical analysis of axles, wheels and other parts of railroad equipment has been given great thought and study, but today brakebeams are used which are made from scrap, without regard to its physical or chemical value. I know of one mill that is rolling sections for the solid type of beam from scrap steel axles. Inasmuch as the price of steel axles is not uniform, it is safe to assume that quality is not. This mill also rolls a section for the compression member of a trussed beam from scrap high carbon steel rails. From my knowledge of the material, I believe it is liable to fracture from shocks, such as an emergency application of the brakes and those incident to a chattering beam.

The chemical analysis of steel rails is not uniform, hence the strength and quality must vary. Steel of this character has gone through various heat treatments to bring it up to a standard required for the purpose for which it is first used, but the heat treatment it receives in the scrap reducing mill is crude and the cooling is governed by the temperature of the atmosphere; hence it is a material of unknown value, and a treacherous material in extremely cold and frosty weather. Would an engineer consider the use of shapes rolled from scrap axles and rails in the construction of railway equipment, bridges and skyscrapers? I think not. Then why use it for such an important and vital part as a brakebeam? I believe the American Railway Master Mechanics' Association and the Master Car Builders' Association committees on standards should determine by tests and investigation the analysis best adapted to withstand the shocks incident to the service of this device and recommend specifications, or at least, have specifications call for the best structural steel.

It is claimed by manufacturers that they test all beams, but I understand this test is only by a direct pull. I know of no beams being subject to a drop test, which would be similar to an emergency application of the brakes.

B. HASKELL, M. E.

After Effects of the War on Business and Railroads*

Railroads Basis of Country's Credit. Their Stability and Prosperity Must Be Protected In New Conditions

BY JAMES J. HILL

The business men of the country are occupying themselves, most properly, with efforts to adapt our interests to the great change of conditions resulting from the European war. Although outside the zone of conflict, we have to pay our tribute and bear our share of the burden. The government is promoting measures looking to the strengthening of our finances, the provision of a merchant marine and the raising of supplementary revenue. Everywhere there is thoughtful study of conditions. Only in mutual co-operation can the sacrifices which a great war imposes on all the nations be lightened. On the whole, the immediate crisis created by the war has been met with wisdom, and its necessary evils combatted with no small measure of success.

The country would, however, be foolish if it did not go further; if it did not examine some of the other needs which have thus far been put off until a more convenient season; if it did not, above all, consider the greater changes in industrial and financial conditions that must be the aftermath of a struggle on such a scale between the commercial countries, which, with us, have been the mainspring of the material progress of the world.

What is to happen when the war closes, leaving half a continent in ruins, killed or maimed industries, and dead and wounded men, the whole structure of the world's activity and intercourse to be rebuilt? What are to be the new conditions under which we as well as others will have to labor, and how may we by wise forethought at this time save ourselves from consequences which affect our own country as well as others, from mistakes that may well if not avoided write the name of the United States among those of the great sufferers by this war?

One common factor will enter into any adjustment after hostilities have ceased, no matter who may be victors. This is the relation of the supply of capital to the demand for it, and the effect of a changed situation in this respect upon the larger interests of the country, in common with the rest of the world. It would be criminal neglect not to consider this future, and make against it what provision we may be able to. For out of accumulated capital have arisen all the successes of industry and applied science, all the comforts and ameliorations of the common lot. Upon it the world must depend for the process of reconstruction in which all have to share. And the need of available capital in the period following the close of this war will constitute one of the greatest problems that the world has had to face.

NATIONS STRAINED THEIR CREDIT

Before the outbreak these warring countries had already strained their credit to the breaking point to provide for internal development and at the same time maintain their enormous military and naval establishments.

The combined debts of the five principal nations now fighting amounted in 1912 to more than \$23,000,000,000. They borrowed several billions more in the following two years. Their expenditures during the continuance of hostilities run from \$25,000,000 a day to twice that sum, according to the activity of movement. In the first 30 days their borrowings or anticipations of credit through note issues ran again into the billions. As soon as peace approaches, not only will all these expenditures and forced loans have to be consolidated and secured on some basis to avoid national bankruptcy, but the financial strain will really only have begun.

The billions upon billions' worth of property destroyed will

*Paper in Forward St. Louis, published by the Business Men's League of St. Louis.

have to be replaced. Granting that a sadder and a wiser world shall determine never again to permit the creation of mighty military establishments which can have no other use than the provoking of war, the amount of money and credit required merely to make good the ravages of the conflict is beyond estimate. Whole cities must be rebuilt. Whole agencies of commercial progress, like the German merchant marine, must be renewed. The annual production of wealth will be lessened by the total labor product of the million or more workers who have given their lives during the conflict. One conclusion stands out more prominently than any other when we come to consider the certain conditions following the conclusion of peace, no matter who triumphs and no matter what its terms. This is that there will be such a relative scarcity of available capital as the world has not seen for a century or more, while the demand for it will be greater than the world has ever known.

Cash and credit will, therefore, in the United States as elsewhere, command higher rates and be more difficult to obtain, probably, than within at least any recent experience. There can be no relief from outside, for the condition must be worldwide. Capital is the most cosmopolitan as well as the most fluid of all the world's resources. In ordinary times it flows instantly from point of supply to that of demand. The nation with a money surplus relieves that with a deficit. But this deficit will be as international as industry itself. The inequality of capital to the work to be performed will be a world condition. It may affect us almost as seriously as those whose homes and industries lie in ruins about them. And it is just this possibility that we should now acknowledge, study and endeavor to prevent.

The largest single industry in the United States is the tilling of the soil, and this will suffer least of all. Our farmers are gathering crops of unprecedented abundance, and marketing some of them at the highest prices received for many years. Whatever else the survivors of the war abroad may lack, they must have food. The farmer needs no considerable supply of extra capital. He has been, on the whole, helped or not hurt by this war, and it will continue to be so. And he is sure, through the working of the new banking law, of money enough to move his crops and finance his legitimate agricultural operations. So he may be dismissed with no more than such temporary and incidental relief as the passing circumstances of the present season may call for.

EFFECT ON RAILROADS

The next greatest industry is the operation of the railroads of the United States, and here we find a situation greatly different. The whole country has taken measures to assist interests immensely inferior. Our commerce is, most wisely, helped in every way possible to tide over the monetary interruptions of war. Our manufacturers are to be helped to reach their markets wherever possible, while movements are under way that will go far towards turning over to them a share of the business formerly done by some of the combatants who will not be in a position for years to come, if ever, to regain the trade that they have lost. But, while the President, in response to an appeal by a committee of business men, has expressed in general terms his opinion that the railroads should receive some consideration, nothing has been done nor is there immediate prospect of definite and effective action. Yet, without the railroad, without its unimpaired service and its constant extension and improvement, neither the farmer, nor the merchant, nor the manufacturer, nor the consumer, can prosper.

It should be obvious to every one that the railroads must be

so treated that they can at least earn in part and borrow in part the vast sums which they are going to require. Unless they can earn, and earn more liberally than in the past, they could scarcely borrow even in such a market as that of the first six months of this year. In the financial market created as a consequence of this war, they will not be able to borrow at all, or only on unfavorable terms and to a limited extent. With pressure upon them from all sides for more wages, more taxes, more facilities, more kinds of costly service and more money to pay the salaries of state and national agencies charged with the never-ending task of investigation and inquisition, they cannot even maintain the unsatisfactory rate of earnings of their recent past. This is not the argument of an advocate for a cause; it is the conclusion drawn from official facts.

According to the latest figures given out by the Interstate Commerce Commission, which are those for the year 1913, the total par value of outstanding railway capital in the United States is only a little short of \$20,000,000,000. Of the total capital stock, almost exactly one-third paid no dividend whatever. On over 10 per cent of the total funded debt no interest was paid. It will take some unusual inducement to tempt capital, even if over-abundant and seeking for investment, to loan in large volume an employment showing such a rate of return.

The work done by the railroads increased in 1913 in every direction. More passengers, more ton miles, more tons of freight per train mile, work and efficiency were growing. Yet the increase in total operating revenue was but \$90,000,000 more than the increase in operating expense, leaving out of account the great increase in other items of expenditure. The present situation is disclosed by some quite reliable figures from other sources, which carry the facts down to a date later than that covered by the last complete official report.

The railroads east of the Mississippi and north of the Potomac and Ohio rivers, in their statement filed with the Interstate Commerce Commission this spring, show that in the last ten years population in their territory had increased 17 per cent, freight traffic 53 per cent, passenger traffic 42 per cent, and mileage only 6½ per cent.

The 35 principal railroads in this territory proved that since 1910 they had added \$659,000,000 to their property investments, and that their net earnings were \$16,311,000 less last year than they were then, although their gross earnings were \$186,775,000 more. All had been eaten up by additional compulsory expenses and taxes. And this affects not merely the holders of stock, more widely diffused among persons of moderate means than ever before, but the more than 1,800,000 employees whose wages cannot be maintained if railroad earnings are reduced arbitrarily below a given point.

The Bureau of Railway News and Statistics has carried the figures right down to the present day. While they are not complete or official, yet, so far as they go, they are computed from reports received by the Interstate Commerce Commission. These show that for the fiscal year ended June 30, 1914, the gross operating revenues of the railroads of the United States were nearly \$80,000,000 less than those of the year before. The ratio of operating expenses, which for 1913 reached the high figure of 69.40 per cent, went to 72.33 for 1914, and in the last six months of the year averaged 75.70. The total taxes paid by the railroads of the country were a little over \$80,000,000 in 1907, and in 1914 they were nearly \$142,000,000. Yet between 1907 and 1913 the average freight receipts of the railways of the country had been reduced from 7.59 to 7.29 miles per ton per mile, a reduction that meant to the railroads \$90,000,000 lost revenue. During all this time, wages, supplies and pretty nearly every item on the expense list have shown a steady increase.

BILLIONS REQUIRED FOR PROGRESS

Now, these are the facts with which the railroads of the country are soon to confront the abnormal conditions that will follow the close of the great European war. Seven years ago a conservative calculation showed that they needed a new in-

vestment of five billion dollars, not to provide for future growth, but merely to do the business that was then offered to them. The need of such investment and the amount of it required to raise the facilities of the railroads to the level of the demands made upon them by the public have grown each year since then.

With the new stimulus which our people reasonably expect after peace is established, the new markets to be satisfied, the new demands filled, all involving additional demands upon the carrier, his machine will break down hopelessly unless it can be made more adequate. That can be done only by securing the investment of enough capital. It could not be done today if the supply of capital and the demand for it stood relatively as they did six months ago. To imagine that it can be done when there is such a poverty of available capital as there will be for ten, twenty, possibly more years to come, is absurd.

WHAT WILL FOREIGN INVESTORS DO?

What are likely to be the effects at home of conditions which surely approach, if no preventive is provided? There are probably \$15,000,000,000 to \$16,000,000,000 of American railroad securities held at home, and from \$3,000,000,000 to \$5,000,000,000 held abroad. What must happen to these securities if nothing is done?

To look only at the probable action of the foreign holder, so soon as the exchanges are opened once more, what is he likely to do with property averaging him a return of 4 or 5 per cent, in another country, when the reconstruction of industry at home is calling for all available capital at a much higher interest rate? What is likely to be the effect upon the railroads, upon the credit of the country, upon the gold supply and the whole financial system, if the holders of these securities are virtually compelled, as sound business men looking for the highest average rate of profit, to dump any such quantity of their holdings upon the markets of the United States? What must be the effect upon business, credit and banking of so profound a disturbance in the basis of such an enormous financial and industrial interest?

I have stated in outline the main facts of the after-the-war situation as it relates to the railroads. Through them it relates to every business and to every family and every man in the country.

The railroads require a loosening of the bonds which even in ordinary times clasp them so tightly that they cannot give to the public the best service of which they are capable. It needs no reversal of general policies, no unsettling of the relation between the railroads and the government, but an agreement upon just two things: First, a general permission to all the railroads to advance rates, if they find it necessary, to not to exceed a certain per cent of the rates at present in force; second, the assurance by common consent of the leaders of public opinion and political action that there will be no more legislation restricting railroad activities, lessening receipts or increasing their expenditures.

The magnitude and the urgency of this matter have not yet impressed themselves duly upon the people of this country. They have been too stunned by the awful and unexpected spectacle abroad, too absorbed in the progress of the most terrible event in history, too involved in study of the immediate consequences which had to be faced almost in the day that they were born, to realize the railroad situation in the new light thrown upon it by the lurid flames of conflict. But it cannot be relegated to a later time or an inferior place.

The railroad is the sap of the industrial tree. It is the speed regulator of industry. It is the thermometer of credit. Its stability, its prosperity, its ability to confront with confidence a totally new era in the capitalistic and credit conditions of the world, must be protected and assured. No duty devolving upon those who sit in the watch-tower of the world while nations sway and fall below them, studying how to guard ourselves against the calamities that their ambition and hate and faith in force threaten to send on us as well as on them, can take precedence of this.

Annual Meeting of Railway Fire Protection Association

Report of the Second Annual Meeting of This Association with Abstracts of Papers on Fire Prevention

The second annual convention of the Railway Fire Protection Association was held at the Hotel Raleigh, Washington, D. C., on October 6 and 7. The meeting was called to order by President F. H. Elmore, superintendent of insurance of the Southern Railway. In his address, the president called attention to the preliminary work to which the association's first year had been devoted and noted that the real work of the society, to prescribe the methods of fire protection, had hardly been begun. He emphasized the necessity of co-operation, first, on the part of members in their relations with the various committees, and, second, on the part of the society towards the operating department, expressing the opinion that once the interest and support of the operating officer were secured, accomplishment would be assured. The real work of the society, therefore, he said, lies in devising practical, economic and effective ways and means for the protection of and the prevention of loss to property. Its province is to develop standard practices and to play the part in the railway field that the National Fire Protection Association plays in industry in general; it must prove to the operating officer and to the latter association that it is the authority in its branch of the subject.

The report of the executive committee showed that the society had increased its membership approximately 57 per cent, and recommended the establishment of a number of new committees.

The Committee on Fire Hazards, Charles N. Rambo (Norfolk & Western) chairman, presented a report, from which the following is abstracted:

The Committee on Fire Hazards has not attempted to ascertain the causes of fire, but rather to consider some of the common hazards that exist and to prepare standards for correction or elimination. It has put its recommendations in the form of bulletins of the Committee on Fire Hazards and proposes that they be improved upon, if necessary, and adopted as standards, possibly in the form of a "Manual" or "General Code" on fire prevention. During the year the committee has prepared six bulletins.

Bulletin No. 1 giving general recommendations for the prevention of fire losses, deals primarily with buildings and is subdivided into four sections: Construction, Care of Property, Lighting, Heating and Power.

Bulletin No. 2 relates to the hazard of locomotive sparks. The members of the committee, without exception, believe one of the greatest hazards to contend with in connection with railroad risk is that of the spark hazard, and it has, therefore, through a sub-committee, gone into the subject very minutely. The bulletin aims primarily toward the elimination of the hazard and invites uniformity of action in connection with the proposed maintenance safeguards. The bulletin is given herewith almost in full:

The hazard of locomotive sparks and the consequent fire damage to railroad and other property has received special study by the railroads and insurance companies.

It seems to us that this subject having been given such careful thought and attention by the departments of railroads vitally interested, is one in relation to which your committee should consider positive means of eradication of the hazard, rather than some of the auxiliary methods that have been pursued to lessen the result of the hazard. By the former is meant that the principal place to offset this hazard is in the roundhouse and shops in keeping the screens, fittings, front end appliances, ash pans and dampers up to the standard as set forth in the blue prints of most railroads. By the latter we mean corrections in construction of buildings, such as has been undertaken in the past through the substitution of a better class of roof coverings, the avoidance of unnecessary pockets in roofs for the accumu-

lation of sparks, etc., the cutting of weeds in the vicinity of railroad property, digging of ditches, cutting of avenues in timber tracts and the application of fire resistive coatings to wood-work exposed or subject to lodgment of sparks or hot coals; and by keeping the ties and stringers on bridges and trestles in good order.

While sparks from smoke stacks or cinders from ash pans may be classed as the primary cause of fires started in this way, the secondary cause is running with damper doors not entirely closed. What may also be termed secondary is the bad condition of shingle roofs, platforms, trestles, roofs of wooden cars, exposed inflammable merchandise in cars, or rubbish about buildings. If the secondary causes were taken care of the result through the primary cause would be reduced to a minimum.

The various motive power departments of the railroads, as well as the Master Mechanics' Association, have given this matter a great deal of consideration and standards have been adopted which, it has been believed, would give generally satisfactory results, by meeting both the conditions of service and minimizing the hazard. On some of the large railroads severe service tests have been made; spark arresters have been given careful constructive consideration, and in many instances the losses from sparks have been greatly decreased. It is a question for the committee to emphasize whether it may not be possible in the future to eliminate fires from this cause entirely. It seems to be a question for the master mechanics, shop and roundhouse foremen to solve by periodical inspection and careful maintenance, as we who are studying the prevention of loss by fire, must necessarily defer to a large extent any investigation of or judgment as to the correction or elimination of the spark hazard to those dealing more directly with the mechanical contrivance concerned.

The main point that this committee can emphasize, therefore, is the importance of the inspection of spark arresters and ash pans; not a haphazard inspection, but an examination of the screen to see if it is stripped or worn out; if the wires are spread, if the fittings around the sides of manhole cover, the nozzle and steam pipes are tight; to see if the ash pan dampers, damper controlling devices and the extension of pan outside of mud ring are in good order. There should be a weekly inspection of all engines and a duly authorized form of report provided, on which the signature of the inspector making the examination should be recorded. There should also be an inspection when any repairs are completed and the locomotive again turned over for road service with the corresponding signature of the inspector making the final inspection. In addition to this, we would recommend that efficiency committees be authorized to check up the inspectors. We also recommend that whenever fires occur on or near the right of way, alleged to be caused by sparks, a report be immediately made of the condition of the spark arresters and ash pans of the locomotives passing the location several hours prior to the fire and that such report be checked against the last weekly inspection of these engines. We also recommend the following as a systematic method of dealing with the subject:

"Master mechanics and engine house foremen should see that all locomotives are properly inspected after each trip, and that any defects in ash pans or ash pan gear are properly reported on special form for that purpose and repairs made.

"Weekly, or at staybolt or boiler wash period, the front end of locomotive must be opened and examined and a special examination of ash pans made. The condition of front ends and ash pans must not only be reported on special form for that purpose, if repairs are necessary, but the condition as found must be carefully noted in book or blank form and signed for by the inspector or inspectors actually making the inspection.

"If repairs are necessary, the front end and ash pans must be

re-inspected upon completion of repairs and proper notations as to condition made in the book or blank provided for that purpose and signed by the inspector actually making inspection.

"Books or blanks when filled should be forwarded to the master mechanic upon whose division the locomotive has been in service, and he will send them to the superintendent of motive power."

Accompanying these suggestions is the blank form of report recommended for use.

We believe with a uniformity in respect to careful maintenance of the corrective influences that have been devised that much can be done in preventing the large fire waste caused by flying sparks. This, however, must receive careful individual co-operation on the part of all railroads and then the motive power departments, and our hope is that we may be able in the future to acknowledge the result of the work of some inventive mind that will bring about the entire elimination of fires caused by sparks thrown from the smoke stacks of locomotives.

Bulletin No. 3 gives general recommendations in connection with chimney flues, stoves and furnaces. Bulletin No. 4 relates to boiler houses, boiler settings and boiler stacks.

Bulletin No. 5 deals with the storage of railway fusees and torpedoes. The handling of these supplies possibly has not resulted in any serious fire loss, but there have been sufficient damage resulting from lack of care and difference of opinion as to proper methods to lead the committee to take up the subject with a view to possible improvements. An abstract of the bulletin follows:

Railway fusees and track torpedoes are classed in the group of "Less Dangerous Explosives" as fireworks; more specifically fusees as "Common Fireworks" and torpedoes as "Special Fireworks" with placards "Inflammable," "Handle Carefully" and "Keep Fire Away."

The hazard of railway fusees and torpedoes is recognized by the "Bureau of Explosives," to whom due acknowledgment is given for suggestions as to handling or storage.

Fusees when handled in original unbroken shipping packages in quantities at distribution centers should be stored in a small magazine, preferably 40 feet from other buildings or lumber. The magazine should be lightly constructed and covered inside and out with incombustible material. It should keep out rain, snow and sparks, and should be provided with a ventilator. No artificial means of heating or lighting should be employed. The magazine should be sufficiently dry if supported on posts or pilings a foot or more from the ground, and so arranged that there is free circulation of air beneath.

Not more than four gross of fusees should be kept in the general storehouse at one time. Any broken packages should be kept in a tight metal lined or asbestos board lined wood box with a spring hinge or self-closing cover. This box should be used for no other purpose and kept in a dry place, not in proximity to any artificial source of light or heat.

Torpedoes when handled in original unbroken shipping packages in quantities at distribution centers should be stored in a separate magazine similar to that used for fusees.

Not more than ten gross of torpedoes should be kept in the general storehouse at any time. Broken packages or loose torpedoes should be kept in a tight asbestos board lined wood box, with sliding cover, used for no other purpose. A sliding cover is recommended in preference to a drop hinged cover to prevent premature explosions in case a torpedo should rest over the edge of the box. The box should be kept in a dry place not in proximity to any artificial source of light or heat, and care should be taken to prevent the accidental dropping of torpedoes on floors where they might be stepped on or run over by trucks.

Placard all magazines and storage boxes: "Explosives—Handle Carefully—Keep Fire Away." Do not store fusees and torpedoes in same magazine or box. Do not store fusees and torpedoes with other explosives or inflammables. Exercise care in keeping fusees dry—improperly made fusees if damp are liable to spontaneous ignition. Broken, wet or oily fusees should be destroyed

by burning. Broken or defective torpedoes should be destroyed by immersion in water.

We suggest as a suitable receptacle for such loose supplies as have been obtained by trainmen from storehouses a small metal or rectangular shaped wood box with spring hinged cover. The box should be only large enough to hold the requisite number of fusees and one end partitioned off for torpedoes. In cabooses racks may be used to advantage for fusees.

The above suggestions are not meant to interfere with any special and safe practice now followed, such as that relating to trainmen's metal receptacles as are now used for carrying flags, fusees and torpedoes.

Bulletin No. 6 deals with storage and handling of small oil supplies at miscellaneous properties. An abstract follows:

One of the greatest hazards is the storage of oil without proper safeguards, and this undoubtedly is one of the most difficult hazards to guard against.

On railroads having little fire prevention supervision, small supplies of oil will be found scattered around throughout the various station buildings, the quantity and location depending on the convenience of the user. At many places the oil supplies will be surrounded by an oil soaked floor and small quantities of oily waste or rags will be in evidence, no thought whatsoever being given to the hazard involved. The danger of such storage without proper precautions is evident, particularly where floors become thoroughly saturated from constant lamp filling drippings.

The fire loss records show that too little attention is being paid to safeguarding the country stations against loss; and a study of this subject will show that a large percentage of fires in them are of unknown origin. Many agents use oil for illuminating purposes; many also take care of signal lights, and in some cases they keep a supply of gasoline for cooking and motor car purposes. Sometimes this oil is kept outside of buildings, but more often it is found stored in the coal bin, or in one corner of the freight room, and quite frequently with records or in concealed places like closets underneath stairways.

The hazard of spontaneous ignition is often present with improper oil storage and handling, for although pure mineral oils in combination with cotton or oily waste or rags will not oxidize and the hazard of spontaneous ignition is not present when they are used, they are often adulterated with vegetable or animal oils and therefore the presence of oily waste in railroad properties is always a menace.

We therefore make the following suggestions and recommendations: Oil storage of every nature at properties other than standard oil houses, wherever possible, should be entirely removed from station buildings and other properties and housed in a separate and inexpensive structure built expressly for that purpose, in a portion of which provision can also be made for the coal supply. This combination coal and oil house should be located a sufficient distance from all other properties to permit possible destruction by fire without endangering any other structure, but not far enough away to be inconvenient. All lamps and lanterns should be filled and trimmed in this structure.

The use of ordinary metal trays or sand boxes is better than allowing cans of oil to set on wooden floors of freight house, but your committee recommends that a separate, isolated coal and oil house be given preference and that if for any reason this cannot be arranged or wherever it becomes impracticable to construct a separate building, a metal lined oil cabinet be installed in the freight room.

Regardless of where or how oil is stored a supply of fine dry sand for extinguishing fires should always be on hand.

At large terminal warehouses, where electricity is used oil is frequently kept in buildings (generally in the basement) often in large quantities, for use in car heaters during the winter months or for oiling warehouse trucks, etc. No matter what precautions are taken to guard against fire the danger is too great for the values at risk. It is recommended in such instances that a separate building be constructed similar to that suggested for station

buildings and miscellaneous properties. Where it is felt that a large expense is warranted, or the city ordinances or fire authorities prohibit the construction of a wooden building, a brick oil house should be built.

In the report of the Committee on Statistics and Forms, presented by B. F. James (Colorado & Southern), chairman, there were submitted several forms as follows: Causes of fires; classification of property losses; telegraphic advice of fire; detailed report of fire (by mail); card notice of fire to be thrown off by trainmen notifying section men of fire; local fire prevention report; fire department drill report; fire inspector's report.

Two of these had been used by the committee in connection with its work in the past year, and it was ascertained that the fires in the past five years on the roads investigated (ranging from 19 roads operating 27,396 miles in 1909 to 28 operating 39,576 miles in 1913) were traceable to the following causes:

Unknown	44.29 per cent
Sparks from engines	20.47 per cent
Heating appliances and flues.....	6.17 per cent
Caught from adjacent property.....	4.55 per cent
Tramps and trespassers.....	3.87 per cent
Incendiary	2.79 per cent
Coals dropped by engines.....	2.45 per cent
All other causes.....	15.41 per cent

The total fires in these five years numbered 10,160, the total loss was, including railroad property and lading liability, \$5,840,644, an average of \$574.86 per fire.

The report on Fire Fighting Organization presented by E. B. Berry (Southern Railway) chairman, emphasized the necessity of forming fire fighting brigades and of regular drills at frequent intervals.

The report on Fire Fighting Apparatus presented by B. S. Mace (B. & O.) chairman, treated primarily of the apparatus used or needed at local freight and passenger stations, at coaling stations and on engines and cars. A brief description was given of the practices that are generally followed on most roads

and various recommendations were made for the further extension of good practices or for the remedying of bad ones.

The officers of the association were re-elected to serve for the following year. They are: President, F. H. Elmore, Southern Railway; vice-president, P. Hevener, Chicago, Rock Island & Pacific; secretary and treasurer, C. B. Edwards, Mobile & Ohio.

New executive committee members were chosen as follows: One year, C. S. Sherwin, Missouri, Kansas & Texas; three years, B. F. James, Colorado & Southern; C. N. Rambo, Norfolk & Western.

FORTY-TON ELECTRIC FREIGHT-YARD CRANE

The illustrations show a modern transfer crane installed at the "West Yard" of the New York, New Haven & Hartford in Providence, R. I., a four-motor electric traveling gantry crane with a main lift of 40 tons, and a higher speed auxiliary hoist of 5 tons capacity. The span from center to center of runway rails is 55 ft. 6 in. This covers a wide driveway and two tracks, while the range of crane travel is approximately 300 ft. About 12 or 15 cars can be set for unloading at one time. In Fig. 1 the crane is shown with a fairly heavy load on the main hook and of a character necessitating careful handling to avoid damage.

The other illustration (Fig. 2) shows how a wide-awake shipper has taken advantage of the new facilities. A certain scrap dealer in Providence ships quantities of metal turnings and filings, collected from numerous machine shops. Before this crane was available, these turnings were all shoveled by hand from wagon to car, holding the team and two men for from one to one and one-half hours for each load, as it was, indeed, hard digging. Now, however, by the use of the removable wagon



Fig. 1—Electric Traveling Crane in the Yard of the New York, New Haven & Hartford at Providence, Rhode Island

body, as shown, the load is transferred to the car in five minutes; and with no other labor than the driver can himself perform.

The wagon body has a hinged tail-board, the latch of which is released by pulling on the rope which is held by the teamster.

The saving in time and labor in a single operation is a comparatively small item, considered by itself, but multiplied many times a day there is a substantial gain for both the railroad and the shipper. Not the least of the benefits to the railroad, when freight traffic is brisk, is the earlier release of inbound cars.

The number of teams using the crane averages perhaps twenty

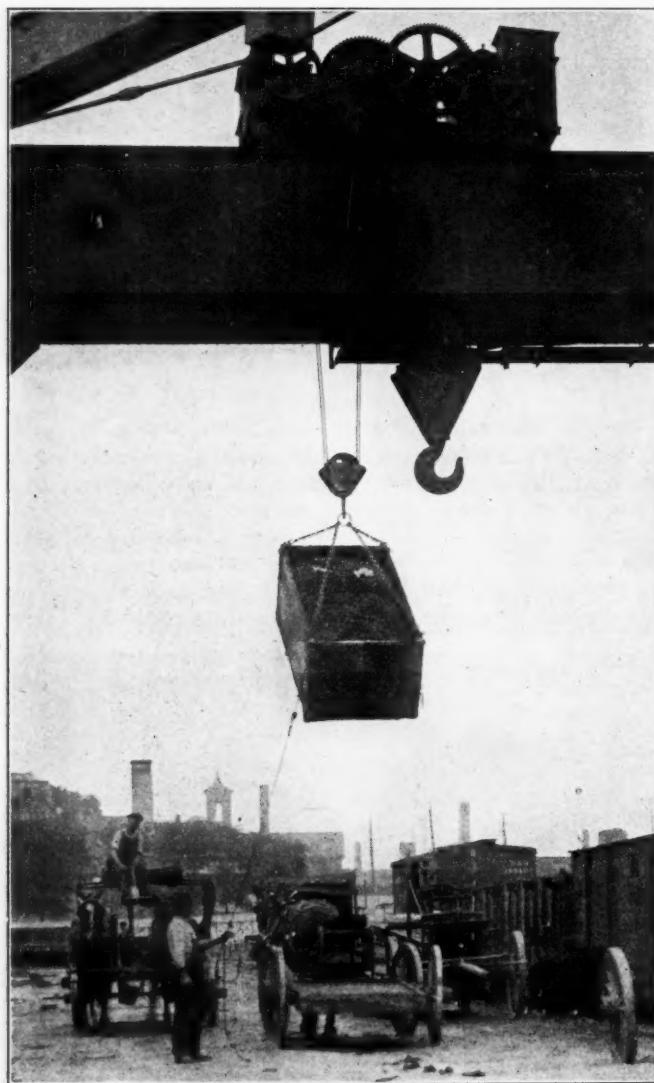


Fig. 2—Loaded Wagon-body, to be Emptied into Gondola

a day, using it to unload or load structural steel and other building materials, heavy machinery, etc.

The cost of this crane, installed, including foundations, was about \$14,000; and the expense of operation is about \$100 monthly.

This crane was built and erected by the Shaw Electric Crane Company, a subsidiary of Manning, Maxwell & Moore, Inc., New York. Alternating current motors are used, protected by weather-tight housings; and electric power is supplied from the central station service.

IRREGULAR EXPRESS SERVICE ON THE TRANS-SIBERIAN.—As evidence of and owing to irregularity of the express service on the Trans-Siberian route, caused by the present situation in Europe, the Korea-Manchuria express between Fusun and Changchun, on the Korean Railways, which has hitherto been operated three times a week, will be run once a week for the time being.

ANNUAL REPORT OF SPECIAL COMMITTEE

The special committee of the American Railway Association on relations of railway operation to legislation, W. J. Jackson, chairman, under date of November 3, has issued Report No. 13, which includes the following:

Two hundred and forty-two roads (227,141 miles) are supporting the work of the committee. The sub-committees have been continued, viz.: (1) officers of the mechanical departments; (2) engineering officers; (3) signal officers.

Practically all the individual bills relating to railway operation have been combined in a single bill giving the Interstate Commerce Commission authority to require the installation, under certain conditions, of block signal systems, automatic train stops, and steel passenger equipment, and authorizing the commission to designate the type of headlights to be used; to investigate roadbed, track, equipment and facilities, and to direct changes, improvements and repairs. This bill has not yet been reported out of committee, but it is probable that this is the form which any legislation on this subject will take. Your committee has obtained the views of a very large number of operating officers on this bill, and is prepared to present the conclusions of the railways on the subject when opportunity offers.

To ascertain the extent of the financial burden placed upon the railways by legislation affecting operation, your committee recommends separation of accounts to enable each road to know definitely the precise amount which it is obliged to pay out by reason of such legislation.

Since the last report no bill has passed both houses of Congress.

A bill changing the penalty clause in the hours of service act has passed the House of Representatives, and is pending in the Senate. If this becomes law, the penalty for violation of that act will be not less than \$100 nor more than \$500, instead of not more than \$500, as at present.

An agreement has been reached with the chief inspector of locomotive boilers as to setting a factor of safety for boilers in service prior to January 1, 1912, and the necessary changes in the rules were promulgated by the commission on June 9, 1914. A bill is pending in Congress extending the jurisdiction of the bureau of locomotive boiler inspection over all parts of the locomotive. The railways have appeared in opposition to this bill.

In April, 1914, a committee of the American Society of Mechanical Engineers proposed a code for the construction, maintenance and inspection of stationary boilers, and offered a draft of a typical law enforcing such code. In view of the inclusion of a number of requirements which were not in harmony with the experience of the railways, the matter was discussed with the responsible officers of the American Society of Mechanical Engineers, and it is thought that the code in question will be materially modified. Your committee, however, has not felt that it should give even tentative approval to any proposed legislation on this subject. . . .

The number of steel and steel underframe passenger equipment cars constructed in the United States in the calendar year 1914, was 3,129, bringing the total number of these cars in existence to approximately 14,100. This latter figure compares with 1,302 such cars in service January 1, 1909.

Your committee on July 11, 1914, bulletin No. 63, containing a revised arrangement for the telegraphic notification of accidents to the safety division of the Interstate Commerce Commission and the bureau of locomotive boiler inspection, together with a cipher code adapted for this purpose. There has been an extremely heavy demand for this bulletin, which was issued with the consent or approval of the heads of both of the departments named above.

Presentation of the railways' case before the Interstate Commerce Commission in the private car investigation, was concluded in June, 1914. The total expense was \$6,129. . . .

During 1915, the legislatures of 43 states will be in session. Your committee has decided to maintain the arrangement of

keeping itself informed of all bills affecting railway operation introduced and passed in all states, and will arrange to notify its supporters of them. Your committee feels that in the states where state committees have been organized, the work done by such committees has been extremely beneficial to the general movement. Their continuance during the session of the legislatures which meet next year is strongly recommended.

An appendix to the report, filling ten pages, gives an abstract of all legislation pending before Congress.

STEAM LOCOMOTIVES OF TODAY

The sub-committee of the railroad committee of the American Society of Mechanical Engineers has prepared a report in the form of a paper for presentation at the annual meeting. The report is signed by G. M. Basford, F. H. Clark and W. F. Kiesel, Jr., and will be presented in the afternoon of Wednesday, December 2, 1914, at the rooms of the society, 29 West 39th street, New York, when a full discussion is invited. The report in full is given below:

Recent progress and improvement in the efficiency and capacity of steam locomotives has been of such remarkable character and extent that a record in the proceedings of this society is justified.

Steam and electric locomotives as rivals in the same field has been a favorite subject for discussion before engineering societies, and it is easy to start arguments in favor of each of these rivals among the partisans interested. Whether or not the steam locomotive is to be displaced by the electric is, of course, an important question which will in time be settled by the court that settles all such questions, that of the treasurer's figures. For the present and for the immediate future the burden of transportation falls and will continue to fall upon the steam locomotive. If the steam locomotive is to be perpetuated it is fitting that it should be improved to the utmost limit. If it is to be finally displaced it is fitting that it shall be so improved in order that progress to something better shall be intelligently developed upon a solid foundation. This discussion will be confined to the steam locomotive, its progress in the recent past, and its possibilities for the near future.

PROGRESS IN CAPACITY

While efforts individual in character and extent were made in this country before that time, the first consistent and systematic plan to secure the utmost power of locomotives within given restrictions of weight and cross-section clearance was inaugurated 20 years ago. This plan began with an eight-wheel or American type passenger locomotive, built for an eastern railroad in January, 1895. This locomotive weighed 116,000 lb., with 74,500 lb. on driving wheels. It provided a tractive effort of 21,290 lb. While this locomotive was not the most powerful in passenger service at that time, it was the first of a chain of passenger locomotives leading in a connected series by the same builders, up to and including recent designs of the Mountain type, representing the largest passenger type of present practice. This type has four-wheel leading trucks, eight driving wheels and two trailing wheels. The largest of the Mountain type weighs 331,500 lb. with 240,000 lb. on driving wheels and produces a tractive effort of 58,000 lb., or about three times the tractive effort of the first design of the series built during a period of 20 years.

In the year 1898 the engineering and railroad world was interested by the appearance of the largest and most powerful locomotive built up to that time. This was of the Consolidation type with a two-wheel leading truck and eight driving wheels. This locomotive was built in Pittsburgh, and for a number of years was the largest and most powerful of its type, and the largest and most powerful locomotive in the world. Its total weight is 330,000 lb., weight on drivers 208,000 lb. and tractive effort 53,300 lb.

Today the most powerful freight locomotive has two leading and two trailing wheels and 24 driving wheels. It gives a

tractive effort of 160,000 lb. and weighs 410 tons. This locomotive has hauled a train of 251 freight cars weighing 17,912 tons, exclusive of the locomotive. The total length of the train was 1.6 miles, the maximum speed attained was 14 miles per hour. This required a maximum drawbar pull of 130,000 lb. This locomotive has six cylinders and three groups of driving wheels.

A freight locomotive has recently been built having two cylinders and a single group of driving wheels which develops a tractive effort of 84,500 lb. Such has been the progress in capacity.

This progress has been rapid, perhaps somewhat too rapid with respect to improvements in operating facilities and progress in other features of railroad equipment. It has been rendered possible by corresponding developments of factors making for greater efficiency in boilers and in engines. During the past 20 years in this country locomotive development in capacity and in efficiency, particularly during the past five years with respect to efficiency, has been remarkable, and is worthy of record with progress in marine and stationary engineering.

In Europe the relatively high cost of fuel led to efforts to improve efficiency before this problem aroused serious attention in this country, but physical limitations more rigidly restricted the size and weight of locomotives in Europe. Our problem is to secure maximum efficiency combined with great size, great weight and great power which is more difficult. Since the development in the size and weight has been tremendous, even though these limits may not yet have been reached, it is now appropriate to concentrate on efficiency.

For a number of years the physical capacity of the fireman to shovel horsepower through the fire door determined the capacity of the locomotive at speeds. Mechanical stokers have removed that limitation. It is now possible to fire six tons, and more, of coal per hour into a locomotive firebox. This has changed the problem into one of getting the maximum amount of heat out of the coal and using it economically in the cylinders. With the large figures now prevailing for drawbar pull and weight it is fitting that closest attention should be given to the best possible use of every pound of metal and every pound of coal. Due to recent application of several economy producing and capacity increasing factors great improvements have already been made with promise of more to come.

Among these economy producing and capacity increasing factors are the following improvements:

Boiler design in the relationships of the factors making up heating surface;
Firebox design;
Front end design, draft appliances, exhaust nozzles;
Ashpan design as to air openings;
Superheating;
Compounding;
Feedwater heating;
Firebrick arches and circulating supporting tubes;
Valve gear;
Detail design to secure reduced weight of reciprocating parts and other parts;
Use of high-grade alloy steels to reduce weights;
Mechanical stokers;
Labor-saving devices for the engineman and fireman;
Improved counterbalancing to permit of greater weight on driving wheels by reducing dynamic stresses.

And yet to come is powdered fuel with possibilities unknown in scope and in importance. Powdered fuel is in reserve, promising the ideal method of complete combustion under control more perfect than is possible with present methods other than oil burning and perhaps with economies impossible to obtain with oil.

PROGRESS IN EFFICIENCY

Valuable comparisons may be drawn from the best results of ten years ago and of today. At the Louisiana Purchase Exposition in 1904 the tests made by the Pennsylvania Railroad revealed important figures concerning locomotive performance at

that time. It was shown to be possible to obtain equivalent evaporation from and at 212 deg. of 16.4 lb. of water per sq. ft. of heating surface, indicating the power of locomotive boilers when forced. It was shown that when the power was low, the evaporation per pound of coal was between 10 and 12 lb., whereas the evaporation declined to approximately two-thirds of these values when the boiler was forced. These results compared favorably with those obtained in good stationary practice, whereas the rate of evaporation in stationary practice lies usually from 4 to 7 lb. of water per sq. ft. of heating surface per hour. In steam consumption the St. Louis tests showed a minimum of 16.6 lb. of steam per i. hp. per hour. In coal economy the lowest figure was 2.01 lb. of coal per i. hp., the minimum figure for coal per dynamometer horsepower was 2.14 lb. These records were made after the superheater had become a factor in locomotive practice and they represent economies attained by aid of the superheater in one of its early applications. This is important in the light of the recent development of the superheater. These remarkable figures have never received the attention which they deserve from engineers. They serve, however, to show that 10 years ago a steam locomotive had attained results which were worthy of the best attention of the engineers of the time. Since then greater progress has been made and today locomotives of larger capacity than those concerned in the St. Louis tests have given better results.

Voluminous records of recent investigations of locomotive performance taken from the Pennsylvania Railroad test plant at Altoona show that the best record of dry fuel per i. hp. hour down to the present date is 1.8 lb., with a large number of less than 2 lb., while the best performance in dry steam per i. hp. hour is 14.6 lb. with a large number less than 16 lb. A reduction of 10 per cent in fuel and 12 per cent in water is remarkable as the result of a development of 10 years. This coal performance was recorded by a class E6S Pennsylvania Railroad locomotive while running at 320 r. p. m. and developing 1,245.1 i. hp. The same locomotive gave a fuel rate of 1.9 lb. while running at the same speed and developing 1,750.9 i. hp. The best water rate was given by a class K2SA Pennsylvania Railroad locomotive while running at 320 r. p. m. and developing 2,033.1 i. hp. These high powers indicate that the locomotives were not coddled as to output of power in order to show high efficiencies, but that high efficiencies accompany actual conditions of operation in severe service. As to power capacity expressed in terms of evaporation, it is interesting to note that the maximum equivalent evaporation from and at 212 deg. per sq. ft. of heating surface per hour on the Altoona test plant is 23.3 lb. These figures of high efficiency were obtained from locomotives which represented not only very careful, general and detail design, but their design included several of the improvements making for greater capacity and higher efficiency.

Having in mind the facts that steam locomotives are power plants on wheels, built to meet rigid limitations of weight, both static and dynamic, and that the use of condensers is impossible, engineers in general must admit the high character of the work of locomotive designers which has attained these results.

Greater efficiency, which is revealed on the test plant and through reports of engineers, would be important because it proves that progress is being made in the possibilities of locomotive performance. Improvement which is revealed by operating statistics and which, therefore, appears in the records of the treasurer's office is the real test in this case. It is important to know that increased power of locomotives, attained largely through the development of economy-producing and capacity-increasing factors, has produced results which the financial reports of railroads prove beyond question. A recently published list of train tonnage on 45 prominent railroads indicates that 16 of these roads have increased their average freight trainloads by over 30 per cent during the last five years. Credit must be given to the improvement in the locomotive for most of this development. These figures reveal the value of increased power and efficiency of steam locomotives and the end is not yet in sight.

WHAT REMAINS TO BE DONE

American locomotive development to its present state would have been impossible without the use of the improvements already mentioned. It is believed that all these are capable of still further development, making for still greater economy in the use of fuel and, therefore, promising greater power capacity. It is the object of the committee to present these possibilities for discussion by those who are engaged in perfecting and improving steam locomotive practice in this country. It is the hope of the committee that engineers who are devoting their attention to the design of locomotives as a whole and those who are engaged in the development of the various details which have contributed to the high efficiency of the steam locomotive of today will discuss the progress of the recent past and reveal possibilities for future development and improvement in capacity and efficiency.

RAILWAY AFFAIRS IN OTHER COUNTRIES

A despatch from London under date of October 31 states that the directors of the Central Argentine Railway (owned by English interests) have decided to raise immediately \$5,000,000 of new capital by the issue of 6 per cent three-year notes at par. These notes will be offered to existing stockholders, and are already quoted at 1 per cent premium. Most of the railroads in Argentina, however, are at the present time meeting with financial difficulty, partly because of the war and partly because of a poor agricultural year. The Buenos Ayres Pacific which paid 3 per cent dividends last year, has passed its dividends. The Central Argentine, the Buenos Ayres Great Southern and the Buenos Ayres Western have likewise reduced their dividends. The Argentine Railway, one of the Farquhar companies has fared even worse. This company, which was formed in 1912 by Percival Farquhar, has control of the Cordoba Central and large interests in the Entre Rios, the Argentine North Eastern and the Province of Santa Fe Railway. It is now understood that the first two lines will break away from the control of the Argentine Railway, and it is also stated that the latter will have difficulty in meeting \$7,500,000 of 6 per cent notes falling due in February, 1915.

The mileage of the South Australian state railways on June 30, 1914, was 1,845, of which 1,052 miles was of 3 ft. 6 in. gage, 85 miles more than on June 30, 1913, and 793 miles was of 5 ft. 3 in. gage, 70 miles having been added during the year. The railway administration also operates under agreement with the Australian government an additional 478 miles of 3 ft. 6 in. gage railway from Port Augusta north to Oodnadatta almost on the Northern Territory line. There are also 463 miles of line authorized or in course of construction. In the fiscal year ended June 30, 1914, the South Australian Railways, exclusive of the Port Augusta-Oodnadatta line earned a total of \$11,349,040, of which \$3,657,067 was passenger train revenue, \$7,456,149 freight train revenue, including \$3,125,649 received for the carrying of minerals, and \$245,775 miscellaneous revenue, such as wharfage, rents, etc. There were increases in all items of traffic except wheat and livestock and the total earnings, \$558,001 greater than in the fiscal year ended June 30, 1913, constituted a new record. The total expenditure, on the other hand, was \$7,318,028, \$544,271 greater than in 1913. The net revenue of \$4,042,772 was equal to 5.33 per cent on a capital expenditure of \$75,812,740 on average mileage open. From this net revenue there were deducted interest charges of \$2,753,175, chargeable to the railways by the government at the rate of 3 1/8 per cent. The surplus for the year was \$1,287,874, or \$1,319,738, including the balance to credit of profit and loss on the Port Augusta-Oodnadatta line; and the administration's total surplus on June 30, 1914 was \$2,593,544. The South Australian Railways in 1914 carried 19,809,533 passengers an average distance of 11.95 miles. The total revenue freight tonnage was 15,082,769, of which 1,617,804 tons were minerals, 300,579 wheat, 26,089 wool, 110,762 livestock and 1,048,237 other commodities. The total earnings per mile open were \$6,250.

Eighth Conference of the Western Economic Society

Report of Meeting Devoted to Subject of "American Railway Problems" With Brief Abstracts of Papers

The eighth conference of the Western Economic Society was held at the Hotel Sherman, Chicago, on November 13 and 14, and was devoted to the subject "American Railway Problems." Various topics pertaining to some of the principal problems involving railway regulation, were assigned to prominent authorities on the various subjects for prepared papers, and each was followed by a general discussion. Following is a brief summary of some of the papers of interest to railway men:

VALUATION FOR RATE REGULATION

Pierce Butler, valuation counsel of the western group of railroads, presented a paper on "The Valuation of Railway Property for Purposes of Rate Regulation." Mr. Butler said that the ascertainment of the value of a thing, whether it be a vacant lot or railroad property, is the determination of a fact, and that the same property cannot be of two or more different values at one time. Reliable knowledge concerning the value of railroad property may be useful for various purposes, for example, as a basis for taxation, as a guide to investors in railroad securities, as an aid to the public control of the issuance of stock and bonds, as an aid to test the reasonableness of the general level of rates, and as a guide for further legislation. It is, however, a mistake to suppose that railroad rates are, or as a practical matter can be, *made or based upon* the value of the property used to render the service. In rate cases involving the question of confiscation, the value of the property is an essential fact, but a rate only high enough to be nonconfiscatory may be much below what is reasonable.

The federal valuation act requires the commission to ascertain and report value, and also to report in detail many facts and much information, so that data may be at hand for the application of whatever principles of valuation may finally be adopted. The value required to be ascertained is not for any particular purpose, so it may become involved in rate-making, in rate-judging, in taxation, in accounting, in capitalization, in public purchase, in sales of securities and it may be used as a guide to future legislation, but it is value in its broadest sense that must be found and reported.

The substitution of cost for value and the making of rates on that basis would unjustly deny reward and profit to the owners of the best railroads of the country, and amount to seizure of the use of private property without just compensation. There is no foundation for the suggestion that there exists between the public and each railroad carrier the relation of principal and agent or beneficiary and trustee. The title to railroad property is not held either in whole or in part, for the use or benefit of the public. The company has the full title and ownership.

VALUATION FOR TAXATION

T. S. Adams, member of the Wisconsin Tax Commission and secretary of the National Tax Association, presented a paper on "Valuation of Railway Property for Purposes of Taxation." Mr. Adams said that the aim or goal of valuation for purposes of taxation is in most states to find the price at which property would sell under normal conditions. What the property cost has, in this connection, no necessary significance. This fact, he said, distinguishes tax valuation from valuation for purposes of rate regulation. Valuation for taxation depends primarily upon earnings, and earnings in turn depend upon rates. It is obvious that no such valuation can be employed for the purpose of regulating or changing rates. For the same reason that local valuation of railway property is bad, state valuation of railway property could advantageously be replaced by federal valuation, or better still, by co-operative valuation on the part of the state governments acting jointly, or through some central bureau maintained by them. Such control, he urged, should certainly go to the promulgation

of binding and uniform rules regarding the allocation or apportionment of revenues and expenditures to the various states. At present there is no uniformity of practice. This is pre-eminently a task for the Interstate Commerce Commission. In his opinion, however, such control by the superior jurisdiction should not go to the length of replacing state by federal taxes.

IMPROVEMENTS MADE FROM EARNINGS

Albert W. Bullard, of E. H. Rollins & Sons, presented a paper on the subject "Shall Improvements Made From Earnings be Capitalized or Included in Valuation?" His conclusions were summarized as follows: That net earnings are the property of the stockholders, and, therefore, property acquired with net earnings is likewise the property of the stockholders. That it is better to invest a portion of the earnings in improvements, and subsequently capitalize them after a liberal surplus has been created than to pay out all net earnings in cash dividends and sell securities to provide funds for all improvements. That valuation has to do with the property owned and not the source from which funds to acquire it were obtained, and therefore, property obtained from net earnings should be included in a valuation for any purpose.

RAILWAY ACCIDENTS AND SAFETY FIRST

Ralph C. Richards, general claim agent and chairman of the Central Safety Committee of the Chicago & North Western, presented a paper on "Railway Accidents and Safety First," which was illustrated with lantern slides and charts illustrating the safety first work on the North Western and accident statistics of the railways of the United States. He said that for all practical purposes the only accidents that can now be materially reduced on the railways without the assistance of the public are those resulting in death and injury to employees. During the 52 months in which the safety first movement has been in effect on the North Western, the company has had 360 fewer reports of people killed and 10,951 fewer reports of people injured than it would have had during that period on the basis of the experience during the year ending June 30, 1910. "This being an economic society," he said, "perhaps some one may want to know what the economic value of the safety first movement is in dollars and cents. The average cost of railroad accidents in this part of the country is \$113.93 per case. So every time you save an accident you save \$113.93. In the 52 months on the North Western, with an increase of 450 miles and about 10 or 12 per cent increase in earnings we have had 11,311 fewer accidents. Any one can figure what the saving in dollars and cents is, although the movement was started to save lives and increase safety and regularity of operation, improve working conditions and create a better feeling between the officers and the men, and only incidentally, to save dollars."

COST OF SERVICE

Halford Erickson of the Railroad Commission of Wisconsin, presented a paper on "Cost of Service as a Basis of Rate Making." Mr. Erickson said that to apply the value of the service principle as the fundamental one to railroads and public service companies generally would be in opposition to the law and to the economics of public policy. The value of the service principle is held mostly by those who argue for the greatest freedom in rate making or who are against any restrictions therein. It is noted for its lack of more exact measure upon which to adjust rates, and for the freedom it gives to the play of judgment and motives. The cost of service basis, on the other hand, is advocated by those whose aim it is to develop more scientific systems of rate making than those now in effect, and who are considering the interests of the public as well as those of the carrier. This basis recognizes the importance of distance in rate making. The

all-inclusive nature of the phrase "value of the service" and its companion phrase "What the traffic can bear," makes it next to impossible to define their real meaning. That the carriers can always be depended upon to treat all shippers, including the public, equitably and fairly, would seem to be refuted by experience. There are such variations in views honestly held as well as in the conditions that are encountered, that even with the best of intentions serious inequalities are likely to find their way into the management of such enterprises as public utilities. It is possible, however, that such phrases may in a sense be applied to the principles involved in the classification of freight.

Many manufacturing plants, where the common expenses are relatively about as great as in railway service, through their systems of cost accounting are in a position to determine the cost per unit so closely that these costs are made the basis for both present and future prices. The methods which are thus successfully employed in the manufacturing world would, it seemed to him, lead to equally satisfactory results if applied to the railway service.

INTERLOCKING DIRECTORATES

"The Economic Significance of Interlocking Directorates in Railway Finance" was discussed by Frank Haigh Dixon, professor of economics, Dartmouth College.

If our judgment as to the desirability of the relationship of railways and credit institutions is to be determined solely by results, he said, we must conclude that the balance swings heavily in favor of the continuance of the present policy. Opposition to the close association of financial houses and railways grows rather out of the concentration and monopolization of credit. The real evil resulting from the interlocking of railways and credit houses, he said, if any evil exists, arises primarily out of the relation of credit institutions to each other, rather than out of their relation to the railways through representation on railway boards. The menace is in the concentration of credit.

As to the interlocking relationship arising from the demands of construction or operation, he said, many of them are absolutely essential, and most of them are harmless. With the power in the hands of the Interstate Commerce Commission and many of the state commissions to control the accounting and examine the books of railway corporations, we may safely assume that public interests will in nowise be prejudiced by the close relationship of parent railways and their subsidiary operating companies. Regarding such affiliations as have the restraint of competition in mind, their economic significance depends upon the purpose in view and the methods by which such purpose is effected.

"When that day comes," he said, "and it is not far in the future, that the commission assumes as complete control of service as it has already done of rates, it will then in my judgment be of little or no public concern whether parallel and competing railways are or are not interlocked. That every evil of a monopoly character will then be done away with for good and all I do not assert. That would be placing too low an estimate on the ingenuity of the financial juggler. But the public advantages of co-operation on the part of large railway systems under the conditions here described so decidedly outweigh any remote disadvantages that there seems to me to be no justification for a prevention of interlocking relationships. Such close co-operation will work not to the restraining of trade unreasonably, but rather to its liberation, for it will permit the execution of co-operative plans for relief in many situations that are now wastefully handled. It will permit the application of the principles of scientific economic railway operation to the railway system as a whole. It is a curious myopia that persists among the American people and demands competition between these great industries to the certain burdening of them ultimately with its inevitable costs. Yet with this prejudice against combination lodged in the breasts of the people, the movement of events as expressed in legislation has been steadily away from reliance upon the efficacy of competition and in the direction of more and more rigid regulation. That it will stop short of government ownership does not seem at all clear."

THE BANQUET

At the banquet on Friday evening, "The Public View of the Railways' Need for an Increase of Freight Rates" was discussed by John H. Gray, professor of economics, University of Minnesota; "The Railways' View of the Freight Rate Question," by E. P. Ripley, president of the Atchison, Topeka & Santa Fe, and "The Efficiency of Railway Operation in Relation to an Advance in Rates," by Samuel O. Dunn, editor of the *Railway Age Gazette*.

PRESIDENT RIPLEY'S ADDRESS

President Ripley spoke in part as follows:

Railroads in this country were built upon the theory that competition would prevent extortion, and the business was considered in the light of other ordinary ventures, but it gradually became apparent that each railroad was a practical monopoly at least so far as certain territory was concerned, and that there should exist some impartial tribunal which should limit the amount of charge which a railroad company might make. The fundamental and underlying trouble with our legislation, as has long been recognized by students of economics, is that our present laws strive to retain the former theory of competition and consequently forbid combination, while at the same time prescribing uniformity in charges, and thus practically rendering combination necessary. This contradiction in our laws is pretty clearly recognized, but no lawmaking body seems to have had the courage to attempt to change the conditions.

Owing mainly, though not entirely, to unintelligent legislation the railroads as a whole find themselves unable to meet the demands made on them; and it is not possible for the best of them to raise money at rates which they can afford to pay. This is not a development of the European war conditions, but something that took place before any war was declared. The attack of the muck-raker and the agitator had done its work and the government, heeding these attacks and ignoring the actual conditions, had in effect declared railroad investments unsafe. It will be said that mismanagement of certain properties has helped to bring about this result, and this is very likely; I am not apologizing for these cases, but they nearly all occurred under your laws and were by advice of counsel.

The simple truth is that rates are unremunerative; that the end of the rope has been reached for some of the roads and is not far off for others. All the talk that has been given us about extravagance in operation, about facilities granted free of charge to favored individuals, about free passes, about mistakes of railroad management, may be allowed for all it is worth and more than it is worth, and the stubborn fact still remains that the public does not pay enough to warrant first-class service, and that it will have nothing else; also that much of our trouble comes from laws that are fundamentally wrong—and that altogether our various governments—state and national—are responsible for these conditions.

I could go on at great length on the inconsistencies and crudities of our present laws; of the impracticable character of regulation by 49 local commissions plus one general commission; of that impossible condition created by the duties of the interstate commission—detective bureau and prosecuting agency in the initial stages—later attempting to act as a judicial body on cases worked up by its own endeavors; and not so much interested in bettering conditions as in getting convictions: rules and regulations prescribed without regard to the cost or inconvenience to the carrier and adding greatly to his burdens.

Even admitting for argument's sake the fairness and ability of each individual member of the commission, there does not exist a body of seven men who could by any human possibility transact the business of 250,000 miles of road; nor who could act as unbiased judges on cases which they had themselves developed and which they or their subordinates had already passed on.

Therefore I say that our present laws regulatory of railroads are a "hodge podge" incapable of intelligent administration. Do not understand me as desiring to be free of restraint—quite the contrary. I simply say that present conditions cannot continue

and the public will rightfully refuse to make investments which the acts of government have made uncertain.

I refrain at this time from forecasting the future; a change is coming because present conditions cannot last. The danger is that they will last long enough to wreck the best railway system the world has ever known and its epitaph will be "Killed by Government Interference."

Arthur Hale, general agent of the American Railway Association, presented a paper on "Freight Car Surpluses and Shortages," which was published in last week's issue.

W. Z. Ripley, professor of political economy, Harvard University, presented a paper on "The Investor's Interest in Railroad Valuation."

EFFICIENCY OF RAILWAY OPERATION

Mr. Dunn pointed out that no evidence had been produced in support of the sweeping charges of inefficiency. The greatest economy in transportation is secured by moving traffic in large units. The density of passenger traffic of our railways is small compared with that of European railways and they haul fewer passengers per train, but between 1900 and 1910 they increased the number of passengers per train 36½ per cent. Between the same years the average tons per train in France increased from 144 to 181; in Prussia Hesse, from 163 to 236; in the United States from 271 to 380. Up to 1913, the freight trainload in this country had increased to 469 tons. The passenger journeys and freight hauls are longer here, but the wages paid are higher. The average annual railway wage in Germany increased from \$338 to \$392 between 1906 and 1911, or 16 per cent, and in the United States from \$588 to \$724, or 23 per cent, and to 1913 to \$758, or 29 per cent. In spite of the relatively high wages paid here, the units of traffic moved per dollar of capitalization and of operating expenses in 1911 were as follows:

	Germany	France	United States
Ton miles per dollar of capital cost.....	8.6	3.8	18.4
Passenger miles per dollar of capital cost.....	5.6	2.9	2.1
Ton miles per dollar of operating expenses.....	67.5	62.9	138.9
Passenger miles per dollar of operating expenses.....	44.3	47.5	15.9
Total traffic units per dollar of capital cost.....	14.2	6.7	20.5
Total traffic units per dollar of operating expenses.....	118.8	110.4	154.8

If the evidence shows that under efficient management net earnings are insufficient to attract sufficient investment a case has been made out from the standpoint of public expediency for higher rates.

ELECTRIC ARC WELDING*

By J. H. BRYANT

Electric arc welding as a commercial process may be divided into two general classes:

First—Benardos or carbon electrode process in which the arc is drawn between the metal to be welded and a carbon electrode.

Second—Slavianoff or metal electrode process in which the arc is drawn between the metal to be welded and a metal electrode.

These two processes are generally spoken of as carbon electrode and metal electrode welding respectively.

In addition to these there is the Xerener process, in which the arc is drawn between two carbon electrodes, as in the arc lamp, and the metal to be welded is placed in contact with the arc. This is, however, not considered a commercial proposition in this country, as its field of application is limited, and the apparatus itself is unwieldy.

Quoting from C. B. Auel in the *American Machinist* (1911): "In carbon electrode welding the metal to be welded is made one terminal of a direct current circuit, the other terminal being a carbon electrode. Upon closing the circuit by bringing the carbon electrode into contact with the metal and then withdrawing it to a distance, an arc is drawn between the two terminals. Through the medium of the arc, which is the hottest flame known

*Abstract of a paper presented before the Western Railway Club, November 17, 1914.

†Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

(having a temperature between 3,500 deg. and 4,000 deg. Centigrade—6,300 deg. to 7,200 deg. Fahrenheit), the metal may be either entirely melted away, molded into a different shape or fused to another piece of metal as desired."

The metal electrode process of welding is a somewhat later development than the carbon electrode method, and differs from the latter in that a metallic electrode is substituted for the carbon.

If direct current is available from a shop or commercial circuit, welding can be done directly from this source of supply, but this method has been found to be very wasteful of power and should not be resorted to except where welding is only to be done at very infrequent intervals. An additional disadvantage of the use of the shop circuit as a source lies in the fact that, unless arrangements are made for insulating the work from ground, the shop circuit is grounded, with attendant danger to other employees in the shop, as well as to the welding operators. A much more economical method is that of using a motor generator set, the motor being constructed with characteristics suitable for operation on the shop or other circuit, and used to drive a low voltage generator. The generator may be either shunt or compound wound, the shunt wound machine being satisfactory where only one arc is to be operated, while the compound wound machine is preferable if several arcs are to be supplied from the same unit. Experience has shown that generators giving a potential of 75 volts or thereabouts will enable satisfactory results to be produced. As different welds require different strengths of current, it is at once evident that there must be some means of regulating the current supply. This is usually effected by inserting resistance in the welding circuit connecting it in series with the arc.

A suitable electrode holder must be provided for both carbon electrode and metal electrode welding. Protective equipment is necessary for the operator on account of the fact that the exposure to the rays of the arc causes an irritation and subsequent peeling of the skin if the exposure has been sufficiently long, say several minutes. The irritation is very similar to sunburn and is uncomfortable, but no serious consequences ensue, and at the end of a few days all traces of the burn disappear.

When the carbon electrode is used, the filling material is usually of the same metal as that being worked upon and may be used in any convenient form. When metal electrodes are used for welding iron and steel they should be of best quality of soft iron or steel wire and may range in diameter from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. The length most generally used is about 12 in. Copper, bronzes and brasses with a low percentage of zinc may also be welded by this process, in which case the electrodes should be of the same material as that being welded. Where the zinc content of brasses is high, it volatilizes to such an extent as to make the work porous and brittle.

The current required for carbon electrode welding varies from a minimum of about 200 amperes to a maximum of around 700 amperes, or even more in very heavy work. In general, however, 300 or 400 amperes have been found to be sufficient for ordinary carbon electrode work.

The metal electrode process, though a considerably later development than the carbon electrode method, has a field of application very distinct in many cases from the older process. Its principal advantage is on work where it is desirable to localize the heat to the greatest extent possible, thus minimizing strains due to expansion and subsequent contraction. An example of this is in the welding of sheet metal or of a broken bridge in a flue sheet. Another advantage of this process is that it enables welding to be done in a vertical plane or even from the underside of the piece to be repaired. With the metal electrodes much lower currents are used than in the carbon electrode process. The maximum value hardly ever exceeds 150 to 175 amperes. For a greater portion of the work a current of about 100 to 130 amperes is found satisfactory, although the amount of current required will vary with the size of the electrode and the class of work being done.

The carbon electrode process is also well adapted for cutting

of metals. In cutting the arc is drawn just as in welding and is played along the line to be cut, provision being made for the melted metal to run off. Very rapid work of this sort can be done, especially if heavy currents are used. The heat generated varies approximately as the square of the current so that a comparatively small increase in current will give a considerable increase in the rapidity with which work may be done.

Among the principal uses of arc welding equipment in steam railroad shops are the following: Flue welding; firebox repairs; frame repairs, and building up of worn parts. Besides these there are innumerable minor uses for the equipment.

General practice varies as regards the best method of welding flues. The time of welding will probably average 15 per hour, although as high as 25 per hour have been reported. This time is for 2-in. flues. Five inch superheater flues are being welded at about one-fourth this rate. It is interesting to note that the flue sheet is found to be in better condition upon removal of flues than is the case where flues have not been previously welded in. This is due to the fact that the welding builds up the sheet around the flue holes to about the original thickness.

Closely related to flue welding is the subject of firebox repairs. The defects to be repaired include cracks in the side, flue, door and crown sheets, leaky staybolts, leaky seams, etc. Also sheets will often be found to be in such condition that repairs are impossible, and it is necessary to put in patches. All of this class of work can be done very satisfactorily by the use of the arc welding equipment. Broken locomotive frames also are very satisfactorily repaired by the use of the electric arc. One railroad (R. F. & P.) reports that it has in service at the present time 65 welded locomotive frames and has had only one failure; this failure was attributed to the fact that the arc weld was in close proximity to one made by another process.

The following figures are taken from records of actual repairs made in a large railroad shop in the middle west at various times, the figures given being a comparison between the actual cost of welding and that of putting the apparatus back into service by methods previously used, either by replacement or by repair of the old parts. The arc welding costs were based on a power cost of 51 cents per hour for the carbon electrode and 17 cents an hour for the metal electrode, together with cost of labor and an overhead charge of 40 per cent. The power costs used are slightly higher than those usually obtaining in shops of this nature:

	Cost of welding	Cost by other methods
Plugging 51 holes in expansion plate, holes 1 in. diam. by $\frac{1}{2}$ in. deep	\$2.75	\$10.15
Repairing mud ring	6.50	34.57
Cutting four 6-in. holes in tender deck sheet $\frac{1}{2}$ in. thick	1.08	8.35
Welding eccentric strap, broken through neck	1.08	41.28
Repairing mud rings	6.50	24.57
Welding two spokes in driving wheel center	7.98	99.98
Welding cracks in bulkhead in tender tank	2.33	8.00
Welding cracks in side sheets	26.15	31.79
Repairing firebox	134.89	869.58
Building up flat spots on locomotive driver .....	.40	225.00

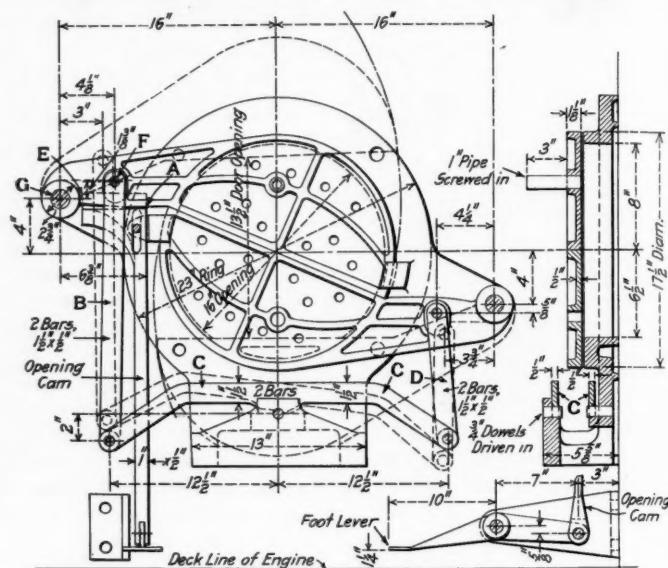
No hard and fast rules can be laid down as to the size of outfit required, as no two installations will be alike in their requirements, and the matter of selection of apparatus of proper capacity is largely one of judgment and experience. In steam railroad shops installations are usually made of sufficient capacity to take care of not less than four to six operators, and the larger shops can occasionally use even greater capacities to advantage. Where a greater number of operators are to be supplied, however, it is generally found to be more economical to install additional outfits in other sections of the shop where welding is to be done, rather than to put in one large central plant. This is on account of the fact that as this work is usually more or less scattered the cost of line copper becomes an item for consideration.

Arc welding is not to be considered as a panacea for all the ills that the metal worker is heir to. There are many classes of work for which it is entirely unsuitable, but its range of usefulness is so wide that it has long since fully justified its existence.

GRAVITY FIRE DOOR

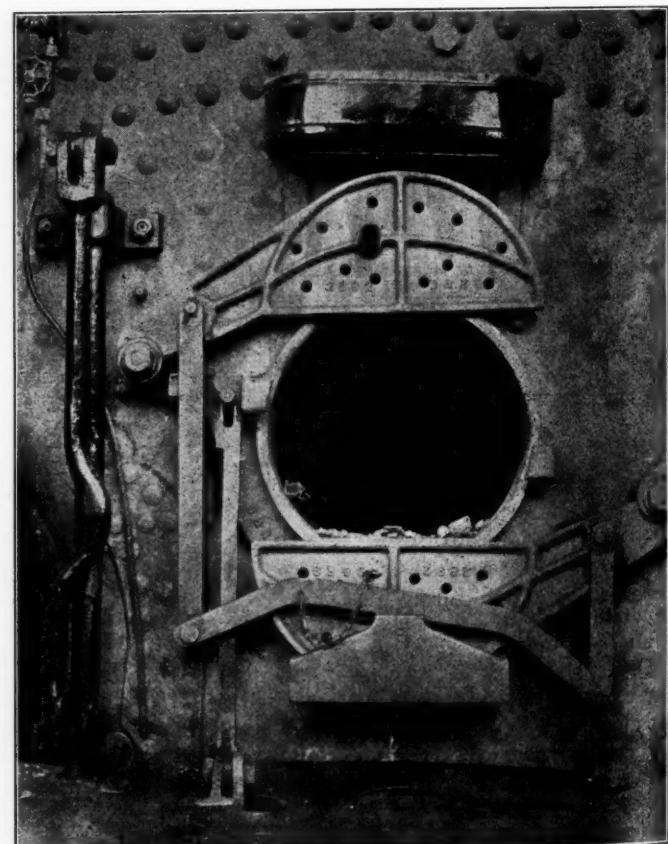
A foot-operated locomotive fire door, the two halves of which are so arranged as to counterbalance each other, thus making unnecessary the employment of a power cylinder, has been developed and patented by P. C. Withrow, mechanical engineer of the Denver & Rio Grande.

As shown in the engraving the door is in two sections, the



Simple Gravity Fire Door

upper part being pivoted at the left and the lower part at the right. It is opened by means of a foot lever located at the left and 20 in. out from the back head. This lever operates the door opening cam, which has a specially formed shoe at its upper end bearing against the under side of the upper door at A.



Gravity Fire Door Locked in Open Position

As pressure on the foot lever opens the door the point of contact between the cam and the door shifts from *A* to *E*. This gives a comparatively large leverage by means of which to start the door without unnecessary effort, and the decreasing leverage as the movement progresses keeps the travel of the foot pedal within reasonable limits.

The upper and lower sections of the door are connected by means of rods *B* and *D* and equalizer *C*. The pin *F* which connects rod *B* to the upper door is located above the hinge pin *G*, thus causing it to swing in closer to the vertical line through the hinge pin as the door is opened. The leverage of the upper door, the weight of which causes the closing movement, is thus increased. It will be noted that the pin which secures rod *D* to the lower section of the door is located at a point much nearer the horizontal center line through the hinge pin than is pin *F* in the upper door. The increase in leverage of the lower door in the open position is therefore less than that of the upper door. A further increase in leverage of the upper section is effected by the rolling contact between equalizer *C* and the door frame at the right of the equalizer fulcrum pin. This causes the fulcrum to gradually travel to the right as the door is opened. The upper door thus has sufficient overbalance to insure prompt closing on releasing the pressure from the foot lever. As the closing movement proceeds the various points return to a normal position, thus destroying the overbalance, and the closing is completed without slamming. The foot lever bracket may be fastened either to the back head or the deck as is most convenient.

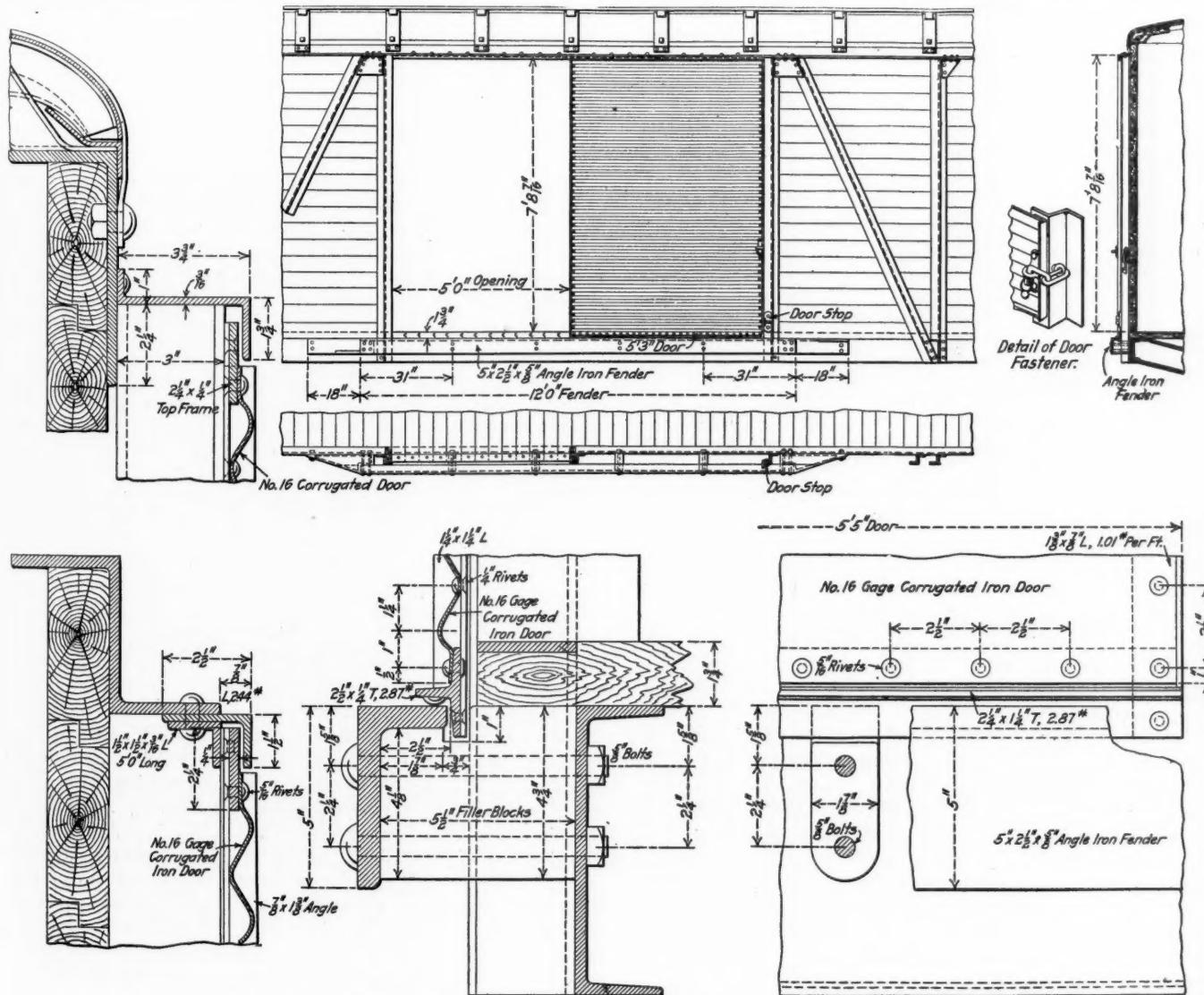
This device has been in use experimentally on the Denver & Rio Grande for about two years, where it has been meeting with

considerable favor. It is claimed that prompt opening of the door is effected without extraordinary effort; sufficient force is brought to bear upon the pedal by the natural swinging of the weight to the left foot as the fireman swings the shovel toward the fire door.

CORRUGATED STEEL DOOR WITH FENDER ATTACHMENT

A corrugated steel box car door which is being manufactured by the American Car Roof Company, Chicago, is fitted with a fender attachment to prevent the doors being raked by wagons, etc., when the car is being loaded or unloaded.

The fender consists of a 5 in. by $2\frac{1}{2}$ in. angle held out from the side of the car by means of cast filler blocks; at the ends snub-nosed castings are used. When shut the front end of the door fits into an angle, the idea being to prevent it from bulging out in case freight should accidentally fall against it on the inside. It is securely fastened by a one link chain and hook in the rear which it is believed is sufficient to keep the rear edge of the door from bulging out. This door does not run on pulleys, but is supported at the bottom near each end by hard bearing points. It is claimed that in many instances after several months' service the pulleys which are commonly used for supporting car doors rust and stick. Further advantage in suspending the door on bearing points at the bottom is claimed, as when it is suspended from the top by means of pulleys, very few bolts or rivets can be employed to carry the weight of the door itself.



Corrugated Steel Box Car Door Equipped with a Fender at the Bottom to Prevent Raking by Wagons

AMERICAN RAILWAY ASSOCIATION MEETING

The fall session of the American Railway Association was held at the Blackstone hotel, Chicago, on November 18. There were present 210 members, represented by 180 delegates. The executive committee reported that the membership now comprises 402 members, operating 274,790 miles, a decrease of one member and an increase of 900 miles. The associate membership now comprises 201 members, operating 12,138 miles, an increase of 38 members and 1,610 miles.

The executive committee also reported that its attention had been called to the use of illuminated electric signs on the rear of passenger trains. The committee adopted the following resolution in connection therewith: "Resolved, that the American Railway Association disapproves of the use of electric illuminated signs on the rear of passenger trains, by reason of the effect they have of concealing essential indications of standard marker signals, and also because they absorb the light of other signals and have a tendency to divert the attention of the employes, whose duty it is to observe signals which are essential in railway operation."

The committee also stated that the president, as authorized at a meeting of the Association on May 20, appointed a committee of nine to investigate such changes as have been, or may be, suggested in the system of uniform standard time, as adopted in United States and Canada in 1883, to report to the Association at the present session. The committee consists of E. B. Thomas (chairman), president of the Lehigh Valley; B. McKeen (vice-chairman), general manager, Pennsylvania Lines West of Pittsburgh; C. W. Galloway, general manager, Baltimore & Ohio; H. A. Worcester, general manager, Cleveland, Cincinnati, Chicago & St. Louis; D. C. Moon, general manager, Lake Shore & Michigan Southern; A. W. Johnston, general manager, New York, Chicago & St. Louis; A. J. Stone, vice-president and general manager, Erie; M. S. Connors, general manager, Hocking Valley, and H. W. McMaster, general manager, Wheeling & Lake Erie.

The committee presented a report, and resolutions recommended by it were adopted asking that when any proposition shall be made for change in standard time of the whole or any part of the membership of the Association the subject shall be referred to the executive committee. The executive committee shall thereupon appoint a committee of nine members on standard time, which shall promptly examine and report on the effect of such proposed change of time—as to its advantages or disadvantages to the road or roads directly affected—to any other member of the Association, or upon the uniform standard time system generally; and it is further recommended that no change be made in the standard used by any member until such committee shall have presented its report and it has been acted upon. The Association urges the roads which made changes in their standard in April and May by adoption of Eastern time in place of Central, and so departed from heretofore uniform standard time, to return to the use of uniform standard upon their lines at the earliest practicable date.

It was decided to discontinue the compilation of statistics of car surpluses and shortages, and of car balance and performance for reasons of economy.

The committee on transportation reported that it has now practically completed the revision of the standard code of train rules for single and double track, rules governing movement of trains with current of traffic on two or more tracks by means of block signals, rules governing movement of trains against current of traffic on two or more tracks by means of block signals, and additional rules for three or more tracks. Before presenting this to the association for adoption it desires to give each member an opportunity to examine the rules and formally submit its criticism. Circular No. 1,472 has, therefore, been issued, embodying the revision of train rules, and replies thereto are requested on or before December 14, 1914. As a result of suggestions which it hopes to receive in reply to this circular, the

committee expects to be able to present a complete report to the association at its May, 1915, session.

COMMITTEE ON MAINTENANCE

The committee on maintenance reported that E. C. Carter had resigned as chairman on account of his retirement from railroad service and A. T. Dice had been elected chairman. The vacancy on the committee has been filled by the election of F. T. Hatch, chief engineer, Vandalia Railroad. The committee announced the result of the letter ballot, ordered at the previous meeting of the association, relative to standard inside dimensions of box cars. Although a majority of the members voted in favor of the three resolutions, the number of freight cars represented by such memberships was less than two-thirds of the freight cars owned and controlled by the members of the Association. The resolutions were therefore not adopted.

The committee also included in its report a summary of the replies to the circular respecting the number of freight cars, passenger cars and locomotives equipped with safety appliances as required by the United States safety appliance standards, as of July 1, as follows:

Number of members reporting, 384.

- (a) Freight cars in service 2,510,214.
- (b) Passenger cars in service, 56,980.
- (c) Locomotives in service 66,853.

Fully equipped with safety appliances required by the United States safety appliance standards, promulgated by the Interstate Commerce Commission in its order, dated March 13, 1911:

- (a) Freight cars 652,999.
- (aa) Freight cars put in service since July 1, 1911, 551,455.
- (b) Passenger cars 52,470.
- (c) Locomotives 63,687.

Fully equipped with secure grab-irons or handholds on the ends and sides of each car, as required under section 4 of the act of 1893, as amended April 14, 1896, and March 2, 1903:

- (a) Freight cars 2,510,214.
- (b) Passenger cars 56,980.

The joint committee on automatic train stops reported that F. C. Rice, general inspector of transportation of the Chicago, Burlington & Quincy, had been elected chairman, vice E. C. Carter, resigned. The committee also reported that it had continued its research of the subject and had received the reports of tests of automatic train control devices which have been recently made. Since the adoption of requisites of installation for automatic train control, as approved by the association on May 20, 1914, no stop device, which has been thoroughly and practically tested and has been demonstrated to comply therewith, has come to the notice of the joint committee. The committee has planned to pursue further its investigations, and has issued a circular (number 1470) to the members of the association for that purpose.

The committee on electrical working reported that the subjects which have been under consideration since its report of April 20, 1914, are those connected with electrical working conductor clearances as affected by permanent way and rolling equipment structures, also specifications for electric power and telegraph or telephone wire line crossings over railways. The existing standards were recommended. The practice of the associations in regard to these facilities has been under investigation by the committee with the view of securing uniformity in standards adopted by various engineering associations. The committee stated that the diagram of the third rail working conductor clearances adopted by the association in May, 1912, has been under consideration by the sub-committee in joint session with sub-committees of the American Railway Engineering Association and the American Electric Railway Engineering Association, with the view of establishing limited rolling equipment clearances in space close to track rail, for permanent way structures or for other devices, such as automatic train stops. These sub-committees have concluded that the "third rail clearance" diagram can be extended towards track rail without materially affecting interchange equipment, and have accordingly adopted the following resolution:

"That the limiting clearance line for rolling equipment as adopted by the American Railway Association should be changed so that the points FE $2\frac{1}{2}/15$ and GE out 15 become FE $2\frac{1}{2}/6$ and GE out 6."

This recommendation was adopted by the association: This provision will allow devices attached to the permanent way to project $2\frac{1}{2}$ in. above top of track rail in space from point $\frac{3}{4}$ in. to point 6 in. distant from gage line.

The sub-committee of Railway Engineers' Association recommended the adoption of the five overhead clearances diagrams approved by the association at its meeting in Chicago, March, 1914, as recommended practice. The association accepted this recommendation.

The specification of the American Electrical Railway Engineering Association for overhead crossings of electric light and power lines was adopted as recommended practice.

The committee advised that consideration of overhead crossings for telegraph and telephone lines had been referred to a sub-committee which has been in conference with similar committees of the American Railway Engineering Association and the American Electrical Railway Association. The sub-committee recommended the adoption of the telephone, telegraph and signal wire crossing specification prepared by the Association of Railway Telegraph Superintendents, with the exception of one paragraph relating to minimum clearances of poles from railway tracks. The side clearance specified by the telegraph superintendents was not considered sufficient, and it was recommended that the minimum clearance of poles be made to conform to that established for the transmission line crossing structures.

The specification which the committee offered has not been definitely acted upon by the engineering associations, but the committee thought it desirable to place on record at this time the essentials of a matter which is of immediate and increasing importance to railroads, and the committee, therefore, offered the specifications for adoption as recommended practice of the association. The association took action accordingly.

The sub-committees appointed by the committee for further investigation of continued subjects are as follows:

On third rail working conductors and on overhead working conductor clearances, A. S. Baldwin, Illinois Central; J. H. Davis, Baltimore & Ohio; E. B. Katte, New York Central.

As representatives of committee on national joint committee on specifications for wire and cable crossings, E. B. Katte, New York Central; J. H. Davis, Baltimore & Ohio.

The committee on relations between railroads reported that it has approved the application of 66 roads to sign the per diem rules agreement, and has rejected the applications of four. It has reported to the executive committee on the eligibility of 47 roads to become associate members of the association.

On the recommendation of the committee a national form of weight agreement was approved.

The committee submitted a code of L. C. L. rules governing receiving, stowing, handling and delivery of less than carload freight, and also recommendations covering methods for handling carload shipments of flour, which were approved.

The committee reported that it was advised that in official classification territory a uniform charge had been adopted of \$2 for cars reconsigned en route and \$5 for cars reconsigned at destination, and that it understands that similar action is contemplated in other parts of the country. The committee also reported that it had authorized an increase in the number of members of the committee on weighing and the committee on packing, marking and handling of freight by the addition of the president of the Freight Claim Association, and the president of the American Association of Freight Agents, ex-officio.

The following were elected members of the committee on the safe transportation of explosives and other dangerous articles: Central of New Jersey, Missouri Pacific and St. Louis & San Francisco.

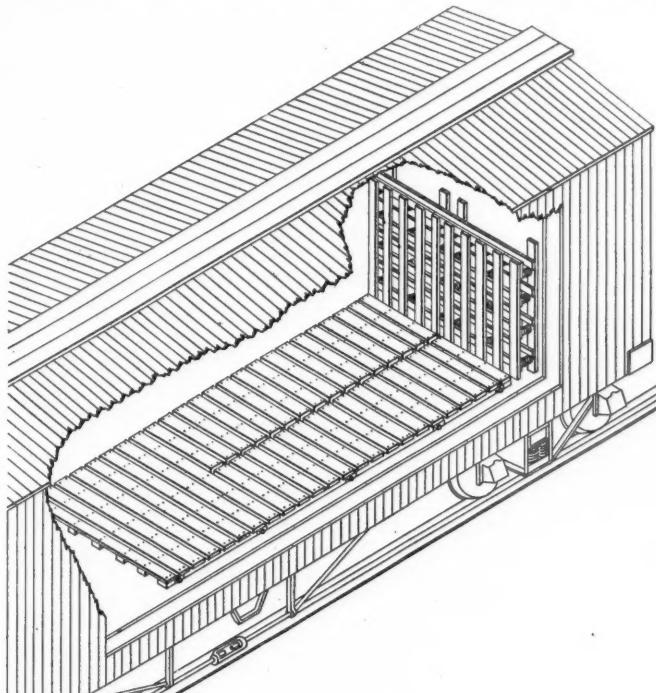
The following were elected members of the committee on electrical working; Illinois Central and Long Island.

The following were elected members of the committee on nominations: C. W. Galloway, Baltimore & Ohio, and W. B. Storey, Atchison, Topeka & Santa Fe. The association decided to hold its next session in Atlantic City on May 19, 1915.

SHOCK ABSORBER FOR FREIGHT CAR LADING

A means of protecting freight of a fragile nature against breakage due to shocks while in transit has been developed by B. Monesmith, of Cresco, Ia., and George E. Cutler, a commission merchant of New York City, and application has been made for patents. It has been applied to two shipments of eggs from Cresco, Ia., to New York City, both of which arrived at destination in perfect condition. Each shipment consisted of something over 400 cases and formed a refrigerator carload.

The patents which have been applied for are designed to cover the application of two principles, one the placing of the load upon a disengaged floor or platform free to move longitudinally upon the floor of the car, and the other a means of absorbing the momentum due to this movement without shock to the lading. The application of these principles to the two refrigerator cars,



Shock Absorber as Applied to Refrigerator Cars for Egg Shipments

while crude in some respects, was very simple and effective in its action. Longitudinals of 2 in. by 4 in. section were secured to the under side of the floor racks and the whole was then placed upon a number of rollers of small iron pipe. These rollers, which are placed crosswise of the car, were held in line by shallow notches in the bottom of the longitudinals, the length of the notches being sufficient to allow a motion on the rollers of about 5 in. With the sections all in place the result is a single structure free to move lengthwise of the car through a distance of about $4\frac{1}{2}$ in. or 5 in. In each end of the car was placed a shock absorber in two sections, temporarily secured to the car with lag screws. Each section of the shock absorber consists of 12 coils of light wire placed between two light timber frames, one of which was secured to the end of the car and the other free to move as the springs were compressed.

In loading a space of about 6 inches remained unfilled at the middle of the car. This was loosely filled with straw and excelsior which on being unpacked at destination showed practically no evidence of having been compressed by the shifting of the load in the two ends of the car, and an egg placed in this space came through unbroken. The cost of the equipment as applied to these cars is stated to be about \$30 per car.

Maintenance of Way Section

The report on concrete posts, presented at the recent annual convention of the American Railway Bridge & Building Association,

Concrete Railway Signs

brought out an extended discussion of concrete signs, indicating the very general interest in this subject at the present time. While one man reported that concrete signs had been standard on his road for six years, a number of others reported that they were using them only experimentally and other members had not used them at all. The sign along the railroad right of way has not only to withstand the ordinary ravages of the elements, but also the more serious attacks of maliciously inclined persons. It is the latter abuse which concrete signs withstand with difficulty. The Santa Fe found that the long thin panels forming the arms of the standard crossing sign were defective in this regard, and have tentatively adopted metal crossarms bolted on concrete posts. For mile posts and similar signs where a heavier post can be used, concrete has been found well adapted. Several methods have been used to bring out the letters or figures in the posts. Probably the most common is the casting of the posts with blocks in place of the letters, which blocks are later replaced with a mixture of lamp-black and cement. The determination of the proper quantity of lamp-black to give a sharp distinctive color, and at the same time to prevent smearing to adjacent surfaces, requires care. Several men also reported a tendency for the inserts to break and fall out. One member stated that he had overcome this difficulty by partially imbedding a number of small staples in the green concrete in the bottom of the opening left for the colored concrete to serve as a bond with the latter. While requiring greater care in handling, the concrete sign is more durable than the wooden and with proper care should prove more economical.

In view of the very general activity of state and local boards of health throughout the country, the importance of the main-

Sanitation of Camp Cars

tenance of clean and sanitary quarters for laborers employed in maintenance work, especially in floating gangs, is being brought more directly to the attention of railroad men. For section gangs the box car removed from its trucks is rapidly being replaced with permanent frame or concrete buildings. However, this is not universally the case, as many old box cars are still doing service as living quarters for the men and, differing from the cars on wheels, after once being set out, they continue to be used long after their proper life has been reached. The real problem, however, is to provide quarters for the floating or extra gangs. Box cars condemned for revenue service make the practical camp for such a gang moving from place to place and can be fitted into very suitable quarters. The men employed in such gangs a few years ago readily maintained their cars in a satisfactory condition, but the general introduction of laborers from southern Europe and Mexico with their lower standards of living, has made it very difficult to maintain sanitary conditions. As a result, railway officers have been inclined to pay less attention to the character of the cars furnished to these men. While in nearly all cases in which complaints have arisen, equally objectionable conditions can be found elsewhere in the community, this is no defense of these conditions on the railroads, and with the present attitude of the public, the railroads are apt to be the first to be criticized. In several states drastic action has already been taken, even to the extent of limiting to four men the number who may sleep in one car. If the roads are to avoid similar requirements in other states, they will have to overhaul their camps in the near future, and then keep them in proper condition.

The timber treating plant at Gautier, Miss., operated by the Louisville & Nashville, was one of the first plants of this kind built in the country. It has long supplied the road with treated bridge timber, but until the completion of the new

Treated Ties on the L. & N.

plant at Guthrie, Ky., described in this issue, no ties had been treated by this road. It is a striking evidence of the satisfactory service of treated timber that a road should extend its use so widely after long experience in one field. This decision to treat ties is also significant because the road is located in a timbered country where ties can be secured on practically the entire system. A comprehensive study of present and probable future costs of untreated and treated ties on the various lines was made in considering the project to build the new plant at Guthrie as the first step in a program of tie preservation. This study showed that economy could be effected by treatment in addition to the well recognized advantage of conserving the available timber supply. In order to secure the maximum economy it was found that the curve ties which must be plated should be creosoted and the others not requiring plates, treated with zinc chloride. In accordance with this conclusion, the plant was designed for both processes, and a great deal of care was used in planning the arrangement and details of equipment to reduce the cost and increase the efficiency of operation. As evidence of the result of this preliminary study, the cost per tie for heating as shown in the early months of the plant's operation, is more than 400 per cent lower than the similar figure in many large plants, on account of the compact arrangement and the improved details of the heating system in the tanks and cylinders.

A few years ago the standard length of rails was 30 ft. Within the past decade this has been increased 33 ft. and

Why Not 40-Ft. Rails?

many men are now asking why this cannot now be increased to 40 ft. The immediate purpose, of course, is to reduce the number of joints and as the joint is the weakest part of the track and expensive in first cost and maintenance, this is an important advantage. One factor limiting the length of rails is the length of the cars available for their transportation. A few years ago 34-ft. and 36-ft. cars were most common, but within recent years cars 40 ft. long or longer have come into very general use. Another objection raised is the necessity of providing increased expansion for the longer rails. However, with the adoption of the heavier sections within the past few years, it has been found possible to reduce the relative allowance of expansion when laying rails so that this is not serious. A third objection is that the longer rails would be more difficult to handle because of their increased weight. This is a serious objection where the rails are handled by hand, but with the adoption of the heavier sections mechanical appliances have come into more general use for unloading and loading rails, as well as for placing them in the track, and the adoption of longer rails would undoubtedly increase their use. From the standpoint of the manufacturers there are more serious objections. Some of the mills will have to be reconstructed in large part to make rails of this length, although other mills are now prepared to roll them in limited quantities. It is also stated that with the increased length it will be more difficult to keep the rails straight. Both of these are serious objections which, however, the manufacturers will undoubtedly be able to obviate when the demand arises.

EXCESSIVE LIVE STOCK LOSSES

THE killing and injuring of live stock on the right of way is a source of loss to the railways which amounts to more than is usually realized. One western system, on which conditions are probably no worse than on many other roads in central, southern and western territory, has analyzed these losses very carefully, and found that for the last fiscal year the claims paid for live stock killed and injured by trains averaged \$27.85 per mile of line. For individual divisions this figure varied widely, being as low as \$6 on some and as high as \$112.49 on one. On another central western road the number of head of stock killed annually on the tracks averages 1.32 for every mile of line.

It is scarcely necessary to point out that claims paid for stock killed represent an absolute loss both to the owner and the railway. The former is seldom satisfied with the settlement, and the roads must pay in addition to the amount of the claim the cost of burying or removing the carcasses. Also, the settlement of claims is a fruitful cause of dispute between the company's representatives and actual or prospective patrons, often resulting in permanent antagonism to the road. When such a loss becomes as great as that mentioned above, special efforts to reduce it are warranted.

The possible success of such efforts depends to a large extent on local conditions. In some of the eastern states, where there is a comparatively small amount of stock, the problem of keeping it off the track is not so serious. On the other hand, in some southern or western states, where stock is raised in large numbers, and particularly where the free range laws are in effect, removing all responsibility from the owner to fence up his stock, a railroad has a very difficult task to prevent trains from striking animals on the track. The first road mentioned above finds that 55 per cent of its stock claims are the result of accidents occurring on 14 per cent of its mileage located in states where these laws govern and the second road killed more than 6,000 head of stock in one state, or 74 per cent of the total for the system, while only 28 per cent of the system mileage is operated in that state. In some parts of the country the owners of stock consider it their inalienable right to let their stock graze on the railway right of way, and attempts to fence this property are not popular and in some cases have even been met with active resistance.

The part of the right of way around stations cannot be fenced off and on every road some live stock is struck within the limits of station grounds. This class of accidents forms 25 per cent of the total on the road referred to. Little can be done to prevent them beyond trying to educate the engineers to be careful and to enlist the co-operation of local employees in correcting conditions that would tend to attract loose stock to the station grounds and in driving such stock out of the way of harm whenever possible.

In the endeavor to prevent the rest of the accidents, which are a large majority, two means are available—to keep the animals off of the right of way and to keep the trains from hitting those that do succeed in getting on. The former involves the construction of fences and cattle guards and their proper maintenance. The typical right of way fence is almost invariably better than adjacent line fences, costing perhaps \$500 to \$700 per mile of line. Such a fence is required by law in many states and in view of the nature of the service that is required of it, is probably the most economical that could be provided. Many cattle guards in service do not turn stock successfully. On the other hand, some states have required pit guards, a type much more expensive than is justified and one the use of which involves actual danger to the stock. It has been estimated by one of the roads furnishing the above figures that 90 per cent of the accidents to live stock on the divisions with the worst records could be eliminated by a complete installation of fence and steel or other-equally efficient cattle guards.

After the installation of proper structures to turn stock, the section foremen have an important duty to perform in

maintaining them. It is very difficult to get foremen to take time from track work to fix a fence before an accident happens, but if they could be made to realize the average loss to the company for stock killed on every mile of line, they would see that they cannot afford to delay the fence repairs too long. In some cases minor points in maintenance are overlooked which destroy the effectiveness of the most expensive fence and cattle guards. Insufficient barriers at small streams crossing the tracks, too much space under wing fences and the leaving out of cattle guards for several days after heavy ballasting work, are illustrations of such points.

The high cost of fences and cattle guards makes it necessary to consider carefully the possible saving to be effected by their installation and in some cases it may be difficult to justify this expense. In general, however, the amount spent to maintain fences is much below the economical figure. The first road mentioned above, for example, spent about half as much for repairing fence during the last fiscal year as for claims paid to owners of stock killed or injured. In so far as greater expenditure for fence repairs would have decreased these stock claims, that use of the money would have been much more beneficial both to the road and its patrons.

COMPARISONS OF RAIL FAILURES BY MILLS

IN compiling the annual statistics of rail failures for the year ending October 31, 1913, an abstract of which is published on another page in this issue, the Rail Committee of the American Railway Engineering Association has made two important departures from the methods followed in compiling previous reports. Up to this time only the failures occurring during the preceding year have been tabulated in the annual reports, but this year all failures occurring since the rail covered by the records of the Association was laid in the track have been included. As the total number of failures in any one year depends largely on the average age of the rail, the total number of failures to date in the rails covered by the records is a better indication of the character of all the rails thus covered than the records of failures for any individual year. While it is unfortunate that a number of the roads are not co-operating with the committee by reporting to it their failures, so that only about 30 per cent of the rails rolled during the period under consideration are included in these statistics, this total tonnage of over 5,500,000 tons is sufficiently large to make any conclusions drawn reasonably representative of the situation throughout the country.

The second innovation in this year's report is the comparison of failures by mills, which is the most important step yet taken by the committee in the analysis of rail failure statistics. It has been common knowledge that there are wide differences in the quality of the rails rolled at different mills and that while some manufacturers have been making every endeavor to improve the quality of their product, the efforts of others have been less marked. The publication of statistics of rail failures, grouping these failures by mills, will serve as an incentive to still further effort on the part of those manufacturers desirous of maintaining a high standard which will force the other manufacturers to meet the standards set by their competitors. The *Railway Age Gazette* has, therefore, repeatedly advocated during the past few years, the compilation and publication of such statistics and in its issue of January 12, 1912, such a tabulation was made and published, compiled from the best data then available. The committee is to be commended for compiling this data in this form for public information, and it is to be hoped that they will be revised from year to year to show the progress made by the different mills. It would appear advisable to separate the mills in some way to equate for the more important differences in the climatic conditions under which the rails are in service. However, despite such differences in conditions which must be allowed for, we believe that the publication of statistics such as these will do much to improve the standards of rail manufacture.

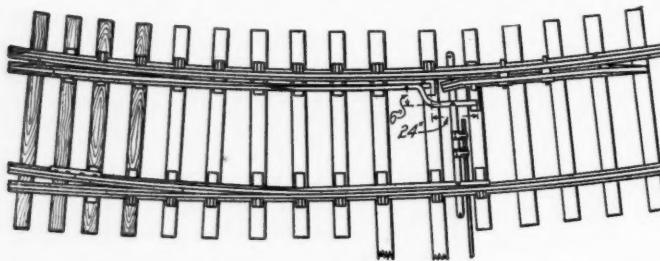
Letters to the Editor

STAGGERED SWITCH POINTS

TULLAHOMA, Tenn.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

An arrangement of switch points very similar to the one described in your issue of September 18, by W. F. Rench, supervisor, Pennsylvania Railroad, has been in use on the Centreville branch of the Nashville, Chattanooga & St. Louis since February, 1908. The only difference apparent from the diagram accompanying the description mentioned is that two tie rods are used in that design and a connecting rod at right angles, while the switch worked out by me has only one rod. The point to be protected is shortened 24 in. and a flanged reinforcing angle extended the same distance with an offset of 6 in. in order to provide room for the guard rail. The head rod is connected to the reinforcing bar the same as to the switch point in standard switches. This switch was patented in December, 1908, having been worked out in order to avoid derailment where a side track leading to the depot at Centreville, Tenn., turns out of the inside of a 20-deg. curve. Before this



An Arrangement of Staggered Switch Points in Use on the
N. C. & St. L.

switch was put in the side line point could only be used four months with safety. After that time the wheel would mount the point and leave the track. With the arrangement shown in the sketch the switch point will last as long as the rails. This has the added advantage that when switch points have to be changed before the rails wear out, the new points do not match the old rails and make rough joints. Three other switches on the branch referred to have a similar arrangement of the points designed to protect the main line points on outside turnouts to avoid danger of derailment and to keep the outside points from wearing. One of these switches is on a 20-deg. curve, one on a 10-deg. curve, and the other on an 8-deg. curve. Arrangements to market this switch are now being made by J. Z. Easley, Nashville, Tenn.

R. A. EASLEY,
Road Supervisor, N. C. & St. L.

AN AGENT'S IDEAS OF EXTRA GANGS

THREE LAKES, Wis.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

This summer a gang of about 30 Greeks spent a month or so putting in ties in this vicinity. They were in charge of an Irish foreman, who admitted that he had no control of them. There were probably half a dozen good workers in the gang, and the rest were drones, but if one of the laziest had been discharged the whole gang would have quit. They received about 15 cents a day more than the section men, and averaged about four ties per day per man. After they were gone the regular gangs had to retamp, line up, and make a track out of the mess they left. If in putting in ties the section men in that district did not average a dozen ties per man per day under similar conditions they would not think they had done a good day's work, but they had to watch those Greeks loaf and draw more money

than they, which probably did not have a tendency to increase their ambition to do good work.

My suggestion for doing such work is as follows: Most section foremen know one or two available men who can be picked up at any time that an increase in the section force is authorized. Why not take half a dozen sections, three each way from the work to be done, pick out two of the best men on each gang for a temporary extra gang, replacing them with the extra men the foremen can pick up, pay them at least two dollars a day, give them a good clean car with clean blankets and bunks to sleep in, and treat them right? The best trackman among the section foremen in the district should be put in charge of this gang at a salary of at least \$100 a month, and he and the gang should be made to understand that they must produce results to hold their jobs. I believe that such a system would cut the cost per tie in half. The men would also feel that the company wanted to do the fair thing with them, and to give them the benefit of any extra money to be spent.

D. E. LAMON,
Agent, C. & N. W.

A LARGE HOOK BLOCK

TOLEDO, Ohio.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

My attention has been called to the description of a 50-ton hook block published in the *Railway Age Gazette* of July 17, in which it is stated that this block is "so far as known, the largest ever built." It may interest your readers to know that a four-sheave block of my design is now in use for oil well drilling that has a working load of 80 tons and weighs 2,015 lb. without the hook. The side bars of the block are 1 1/8 in. thick, and 8 in. wide; the plates are 3/8 in. thick, the separators are of cast iron, the sheave pin is of forged steel 4 1/2 in. in diameter, the shackle bolt is 2 15/16 in. in diameter, and the becket bolt is 2 7/16 in. in diameter. The sheaves are of cast iron 26 in. in diameter, bronze bushed, and designed for a 1-in. wire rope.

The hook that is used with this block weighs 800 lb., and has a working load of 75 tons. The Union Tool Company, Los Angeles, Cal., which manufactures this block, also manufactures a five-sheave block which weighs approximately 2,600 lb., and has a working load of 100 tons.

WILLIAM H. WOLFGANG.

NEW BOOKS

Plane Surveying. By William G. Raymond, dean of the College of Applied Science, State University of Iowa. Size 4 1/2 in. by 7 in., \$90 pages, 239 illustrations, 19 tables and 7 plates. Flexible leather binding. Published by the American Book Company, New York. Price \$3.

The second edition of Raymond's "Plane Surveying" has just been issued in pocket book form. Portions of the book as written 18 years ago have been rearranged and all of it rewritten, although little change has been made in the subject matter. This book is intended for classroom use and deals largely with land surveying. The author does not attempt to go into the details of the operations of various surveying methods, but explains principles fully, and includes problems intended to show the possibilities and limitations of the various instruments and methods.

Surveying Manual. By Howard Chapin Ives, professor of railroad engineering, Worcester Polytechnic Institute. Size 4 1/2 in. by 7 in., 296 pages, illustrated, bound in flexible leather. Published by John Wiley & Sons, New York City. Price \$2.25.

Ives' "Surveying Manual" has been prepared for the use of students in engineering courses other than civil, and is therefore more elementary than most of these manuals. The use of all the common instruments is covered, and there are chapters on railroad curves, the laying out of public lands, computation, plotting, latitude, longitude and azimuth and large surveys. The common tables which are required in using the ordinary instruments are included for easy reference.

New Tie Treating Plant With Unique Features

L. & N. Builds Two-Cylinder Plant at Guthrie, Ky., After Careful Study of Timber Conditions on Its Lines

The Louisville & Nashville has operated a new wood preserving plant at Guthrie, Ky., for the past season, which is designed to treat ties either with creosote or zinc chloride. The Bethell process with 8 lb. of creosote per cu. ft., and the Burnett process with $\frac{1}{2}$ lb. of dry zinc chloride per cu. ft. injected in a 4 per cent solution are used. The ties treated at the new plant are red oak and black oak. The capacity of the plant is about 800,000 per year.

GENERAL

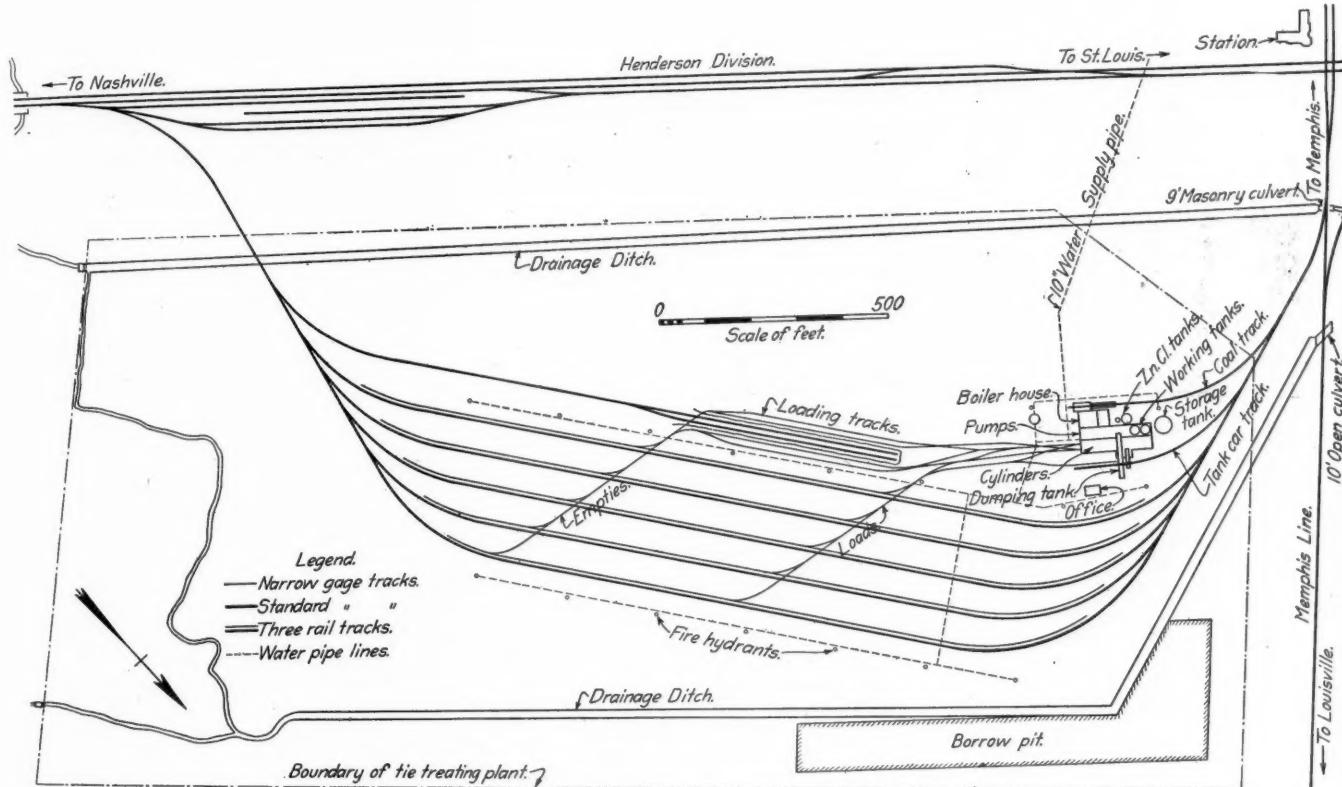
White oak ties were formerly standard in the territory to be served by the new plant, these ties being plated on curves, primarily to resist rail spreading rather than wear of the ties. In determining whether to replace these ties with treated ones, and if so, the type of treatment to be used, comparative capitalized costs of untreated, creosoted and zinc chloride treated ties, both with and without tie plates, were prepared. Including all items, such as the cost of ties and treatment, transportation, interest

and Decatur. As timber can be secured over practically the entire L. & N. system, it is expected that additional plants will be located at the most economical points for distribution and in choosing future locations it is planned to limit the haul of treated ties to about 150 miles, which is equivalent to a transportation cost of \$0.06 per tie.

The tie supply for the Guthrie plant is secured within a radius of about 100 miles. The ties are delivered along the track by the contractors and are inspected by a representative of the timber department of the railway before being loaded by the section gangs. The standard tie is 7 in. by 9 in. by 8 ft. 6 in., and the standard method of stacking in the tie plant storage yard is 1 by 9. Practically all ties for treatment are loaded in box and cattle cars.

STORAGE YARD

The new plant is located on a tract of about 70 acres in the southeast intersection angle of the Henderson division and



Layout of New L. & N. Tie Treating Plant and Storage Yard at Guthrie, Ky.

on treating plant, etc., and with an assumed life of 8 years for an untreated tie, 11 years for one treated with zinc chloride and 14 years for one treated with creosote, the zinc chloride treatment was shown to be the most economical without tie plates and the creosote with them. The present standard has therefore been changed to provide for creosoted ties on curves which are tieplated anyway, and zinc chloride ties without plates on tangents. As the cost of timber increases, the advantage of zinc chloride over creosote is reduced and it is expected that eventually creosote will be substituted for zinc chloride.

The new plant was located at the intersection of the Cincinnati-Memphis and the St. Louis-Nashville lines in order to facilitate the distribution of the treated ties over a large area. The ties will be shipped as far as St. Louis, Memphis, Louisville

Memphis line tracks and directly opposite the Guthrie station. The track connections to both lines, the layout in the storage yard and the position of the buildings are shown in the accompanying plan. The grading of the yard required the moving of about 50,000 cu. yd. of material, most of which was taken from drainage ditches with a bottom width of 20 ft., which were dug along each side of the property, and the remainder from a borrow pit conveniently located. Open drains were provided across the yard at intervals of about 120 ft., and the surface was sloped 0.5 per cent towards the east side. Drains are to be put in transversely under each track in line with the open drains.

In order to secure nine months' storage before treatment, space sufficient for stacking about 450,000 ties has been provided along the yard tracks. Five three-rail tracks, averaging

about 1,650 ft. long, are spaced 73 ft. center to center, the standard gage tracks connecting by 14-deg. curves to a ladder track at each end leading to the main lines. Two narrow gage ladder tracks cross the yard at an angle of 46 deg. There are also a standard gage lead from the south ladder to the two depressed load tracks, a coal track leading to the coal trestle alongside the boiler house, and a tank car track reaching the receiving tank.

A double crossover is located between the narrow gage tracks immediately in front of the cylinders and the number and arrangement of tracks leading to the cylinders is calculated to facilitate the movements of trains of tie cars. Ordinarily the north narrow gage ladder track is used for loaded trains going to the cylinders and the south ladder track for empties going from the loading platform back into the yard for ties. The yard is laid with cinder ballast and white oak ties, 70-lb. rail being used on standard gage tracks and 58½-lb. rail on the narrow gage tracks.

The ties are stored in piles 11 high. As many as 65 tie handlers are used to unload and stack the ties, the rate for this work being one cent per tie. The loading of treated ties is handled by the same men using skids from the trams into the standard gage cars on the depressed tracks. A tie checker and the superintendent are in charge of the operation of these tie handling gangs.

A 32½-ton narrow gage steam locomotive is used for all



General View of the Tie Storage Yard With the Treating Plant in the Background

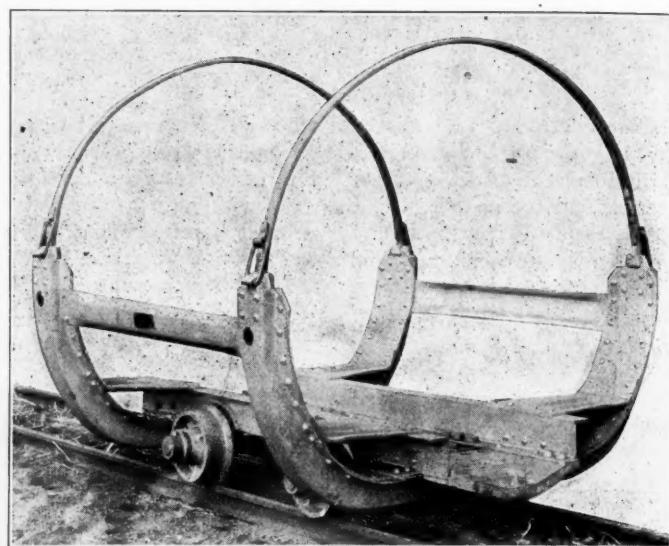
switching of standard and narrow gage cars in the yard. It is a four-driver Baldwin locomotive, weighing 65,000 lb. and equipped with Walschaert valve gear. It is capable of handling 12 to 14 loaded box cars. An engine pit and penstock are provided for this yard engine near the cylinder building.

The tie trams, of which there are 120, are of a new design by the Allis-Chalmers Company, providing unusual strength. The frame consists of heavy Z-bars with cast steel bumpers at the ends and mounted upon square steel axles securely bolted to the Z-bars. The arms are of cast steel consisting of a flat upper plate and a lower plate pressed into a tapering box section securely riveted together and to the frame. Additional stiffness is provided by connecting the arms to the top of the Z-bars by corrugated gusset plates. The design has been carefully worked out to provide the strongest section at the point where the greatest stress is applied. The arms are further stiffened by connecting them near the top on either side with a pressed steel brace. A flat bail and a link connecting by a locking device of malleable iron riveted inside the arm are provided, these features being patented. The wheels are provided with roller bearings and are held in place by cast iron collars secured to the ends of the axles. As the axles are secured to the frame by a single bearing there is no obstruction outside of the wheels, making it possible in case of breakage to remove any wheel without disturbing the remainder of the car.

BUILDINGS AND TANKS

The main building is 156 ft. by 58 ft., with a boiler house, 66 ft. 7 in. by 36 ft. 1 in., on one side and a test cylinder room, 12

ft. 1 in. by 32 ft., on the other. A dumping and drain tank cellar extends transversely under the middle of the building and the main floor is divided into three parts, the cylinder room, the pump room and the working cylinder room. The foundation is of concrete with reinforced footings under concentrated loads. The basement walls are also reinforced. The floor over the cellar is a 4-in. reinforced concrete slab supported by 16-in. concrete beams. The floors in the other portions of the building are also of concrete 4½ in. thick laid directly on the fill. The walls of the building are of brick with Fenestra steel sash in the windows, some of which are movable for ventilation. The

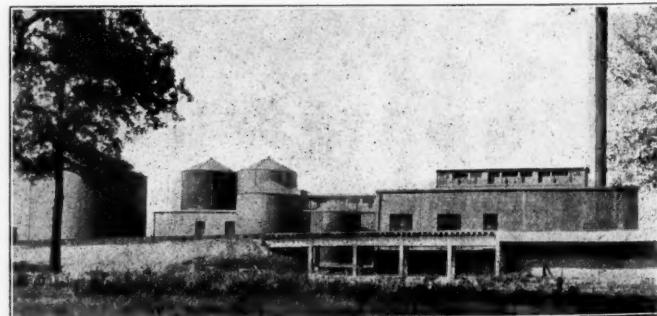


Heavy Tie Tram of New Model Designed for This Plant

roof is a 3½-in. reinforced concrete slab supported by 15-in., 42-lb., I-beams and covered by a composition tar and gravel surface. A monitor of reinforced concrete construction provides additional light from the roof.

An office building of brick construction, which also includes a laboratory, is located near the main building.

The storage tanks for creosote oil and 50 per cent zinc chloride solution and the mixing tank for the 4 per cent solution are located outside the building, but immediately adjacent to it. All other tanks and equipment are contained in the building, the arrangement being unusually compact. The creosote oil storage



Side View of the Treating Plant Showing Tanks, Boiler Room and Coal Dumping Trestles

tank is 40 ft. in diameter and 30 ft. high, of standard steel construction, the roof being supported by two angle iron trusses placed at right angles to each other. Its storage capacity is 273,405 gal. The zinc chloride storage tank is 15 ft. by 15 ft., with a capacity of 18,827 gal., and the 4 per cent mixing tank adjacent to it is 20 ft. by 20 ft., holding 44,983 gal. The working tanks, which extend up through the roof of the building, are 20 ft. in diameter and 24 ft. high, each having a capacity of 53,944 gal. They are set up 7 ft. 2 in. above the floor level on a re-

inforced concrete slab supported by four 12-in. concrete walls on a reinforced concrete foundation mat.

A 4-in. air space is left between the tanks and the protective cover above the roof of the building. The heating system in these tanks, which is one of the unique features of design, consists of straight lengths of pipe extending from a manifold. Each length of pipe consists of a 1-in. live steam pipe inside a 2½-in. exhaust pipe. The end of the larger pipe is closed by a plug, the inner surface of which is rounded so that the live steam coming out in the inner pipe is directed back through the annular



End View of Treating Plant Showing Boiler Room, Cylinder Room and One of the Heavy Narrow Gage Locomotives

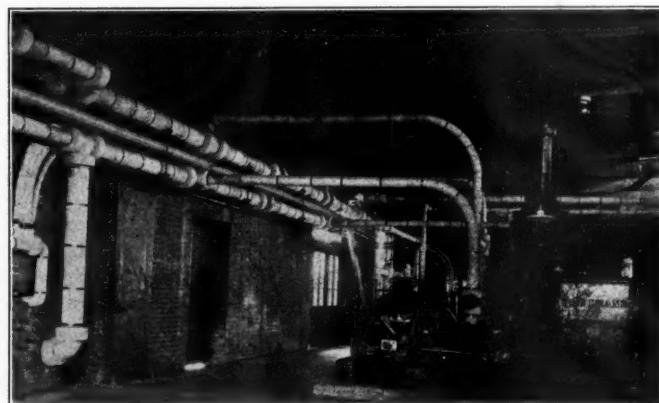
space around the smaller pipe. Important advantages of this system are that each line of pipe is free to expand or contract and that the pipes can be easily removed for cleaning. By carefully locating the points at which these heating pipes enter the tanks, it was made possible to draw them straight out through windows in the side of the building.

With the exception of a measuring tank 4 ft. 8 in. in diameter by 8 ft. 9 in. high for the test cylinder, which is located in the test cylinder room, all of the other tanks are arranged in the basement under the building. One of these, 7 ft. in diameter and 38 ft. 4 in. long, is used to receive either creosote or zinc chloride from tank cars standing on the track outside. Another 7 ft. by 100 ft. receives the contents of the cylinders at the com-

pletion of a change. A 3-ft. by 10-ft. drum is used for measuring the 50 per cent zinc chloride solution when transferring it to the mixing tank and a 3-ft. by 15-ft. sap drum is provided to receive the sap coming from the cylinders during the application of the preliminary vacuum.

zinc chloride from the tank car receiving tank to the proper storage tank, being provided also with a 2-in. suction line to connect to the dome of a tank car if it cannot be discharged by gravity; one 12-in. by 12-in. by 12-in. Worthington tank duplex piston pump for transferring the solution from the 7-ft. by 100-ft. dumping tank to the working tank, suction and discharge lines also being arranged to connect to any of the outside tanks; and two 7½-in. by 4½-in. by 12-in. Deane oil-pressure pumps equipped with automatic pump governors for applying the pressure on the solution in the treating cylinders. There is also one Deane 10-in. by 16-in. by 12-in. duplex crank and fly wheel vacuum pump with jet condenser for exhausting the air in the cylinders before the application of the solution and one 4½-in. by 2¾-in. by 4-in. Deane duplex oil pressure pump for use with the test cylinder. No air compressor is included in the present equipment, although provision has been made in the piping system to connect up a compressor in case it should be decided in the future to use air in the treatment or for transferring the solution.

The boiler equipment consists of two 200-hp. Vogt boilers of the water tube type equipped with "Vigilant" feed water regulators. A 500-hp. Cookson open type feed water heater and two 6-in. by 4-in. by 6-in. Blake duplex center packed plunger type feed water pumps are also installed. The boilers are equipped with automatic stops and check valves. The

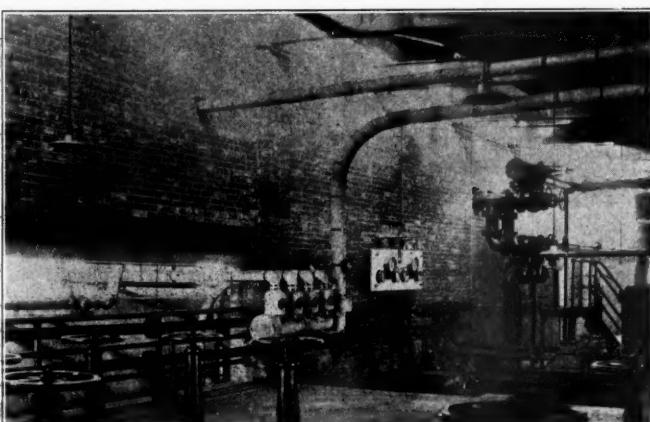


One End of the Pump Room Showing Type of Equipment and Piping Arrangement

boiler draft is furnished by a 100-ft. steel stack, 4 ft. in diameter. An 8-in. steam header supplies all pumps and heating coils in the cylinders and storage tanks. The coal for the boilers is dumped in a reinforced concrete hoppered chute alongside the boiler room, which is approached by five spans of reinforced concrete trestle.

The water supply for the plant is secured from the railway's pipe line at a pressure of 35 to 40 lb. The zinc chloride mixing tank and the boilers are supplied directly from the feed line and a 50,000-gal. steel tank is kept full for use in emergencies. A 16-in. by 9-in. by 12-in. Blake & Knowles duplex Underwriters' fire pump, with a capacity of 750 gal. per min., is provided, and an ample number of fire hydrants are located throughout the storage yard and around the buildings. The plant is lighted by electricity furnished by a 7½ kw. d. c. generator located in the pump room.

The piping received a great deal of study in the design of the plant, both as to the details of pipe material, valves, fittings, etc., and the arrangement of the runs to simplify as much as possible the operation of the plant. The same relative position is maintained between all pipe lines, valves, gages, etc., which are in duplicate for the two cylinders, thereby eliminating as far as possible the chance for mistakes in using the equipment. The steam and exhaust lines are of standard steel pipe with 250-lb. flanged and screwed fittings for the former and 125-lb. fittings for the latter. The steam lines include five steam traps. The



One Corner in the Operating End of the Pump Room Showing Arrangement of Valves and Cylinder Room Through the Opening at the Left

pletion of a change. A 3-ft. by 10-ft. drum is used for measuring the 50 per cent zinc chloride solution when transferring it to the mixing tank and a 3-ft. by 15-ft. sap drum is provided to receive the sap coming from the cylinders during the application of the preliminary vacuum.

PUMP EQUIPMENT AND PIPING

Four solution pumps are provided; one 7½-in. by 8½-in. by 10-in. duplex piston tank pump for handling either creosote or

air lines are of 175-lb. flanged cast iron pipe with 250-lb. fittings and 125-lb. steel pipe with 125-lb. fittings. All solution lines 4 in. in diameter or over, and the 3-in. pressure lines, are of flanged 175-lb. cast iron pipe, all other solution lines being of standard steel. The high pressure solution lines have 250-lb. valves and fittings and low pressure 125 lb. The fire lines in the yard are of hub and spigot cast iron pipe.

Gate valves are used in all water and solution lines, and in some steam lines where it is essential that the valves be either full open or shut. Throttle valves of the globe type are used in other lines. Provision for expansion in the 10-in. pipe line leading to the 40 ft. by 30 ft. creosote storage tank is secured by inserting an 8-in. steel U-bend, and 6-in. copper expansion joints are used in the connections to the two exterior zinc chloride tanks. The problem of providing for expansion is greatly simplified by the location of the tanks close to the building.

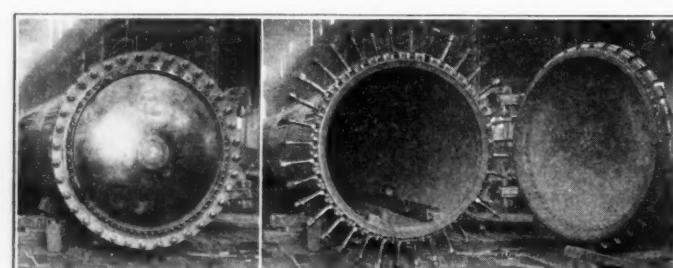
All valves in solution lines that need to be operated in treating a charge have long stems which are carried up through the floor slab over the cellar to stands which are carefully grouped to simplify the operation of the valves. All valves and indicators used in treating a charge are located within a space 60 ft. by 24 ft.

CYLINDERS

The two cylinders are each 133 ft. long and 7 ft. in inside diameter. They are designed for a working pressure of 250 lb. per sq. in., the shells being of $\frac{3}{4}$ -in. flange steel. Each shell is made in 17 courses, each course being a single plate 99 in. wide. The circular seams are lapped and double riveted and the longitudinal seams are double butt strapped and triple riveted. The cylinders are supported on cast iron saddles, the one located near the center being bolted securely to the foundation while the others rest on rollers allowing free expansion.

The doors are of the built-up type, consisting of a cast steel shell frame, a cast steel door frame and a flange steel dished head riveted to the door frame. The door is secured by 36 T-head bolts resting in semi-circular grooves in the shell frame. Each bolt is secured in place by a bolt retainer fastened to the shell frame. The door hinges are designed to carry the entire weight of the door when opening and closing, and are provided with ball thrust collar bearings making the door easily operated.

The track construction used in the cylinder was adopted on account of its strength and the fact that it absolutely prevents



The Built-up Doors for the Treating Cylinders, Closed and Open

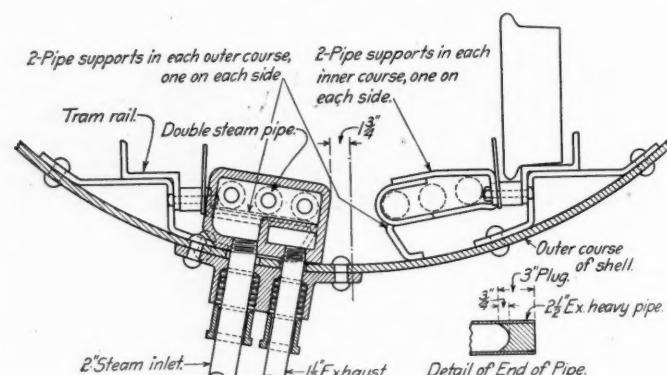
the derailment of cars in the cylinders. The track consists of heavy Z-bar rails mounted on pressed steel brackets riveted to the shell. The wheel is guided by a heavy steel plate bolted to the inner flange of the Z-bar and separated from it by cast iron spreaders, the height of this guide plate being such that the wheels cannot pass over it when a car is in its highest possible position.

Each cylinder is provided with a 36-in. by 36-in. dome located near the center, within which an automatic float valve is operated by a pressed steel float secured to the lower end of the valve stem. An electric indicating device is arranged on the upper end of this valve stem and properly connected to a bell or light in the pump room to notify the operator when the cylinder is full and the valve closed. This arrangement has

been found to be a decided improvement over gages, indicators, or similar devices.

The system of heating the solution in the cylinder is the same as that described above for the working tanks, except that $\frac{3}{4}$ -in. and 2-in. pipes are used. The manifolds are located at the center of the cylinder from which the heating pipes extend in both directions. The steam inlet and exhaust pipes are screwed directly to the bottom of the manifold, preventing leakage of steam or water in the cylinder and also preventing leakage of oil from the cylinder around the pipe connections. Two sets of pipes are provided in each cylinder, a clear space being left between them in order to make it possible to flush the cylinder to wash out any accumulation of chips, dirt, etc.

The compact arrangement of the plant makes it possible to maintain the desired temperature in the working tanks and cylinders.



Detail of Pipe Arrangement for Heating Treating Cylinders,
Showing Also Track Construction in the Cylinders

ders without undue loss of heat in transmission, as no long exposed pipe lines are required. In view of the consideration which was given this feature in the design, it was gratifying to find that the actual cost of heat per tie for the first three months of operation was less than 0.2 cents.

A test cylinder 3 ft. 6 in. in diameter by 11 ft. 6 in. long with all necessary piping connections is installed for experimental work which is being carried on continuously.

OPERATION

The standard method of treating is, first, to apply a vacuum of 20 to 24 in. for one hour, then without relieving the vacuum, to allow the creosote or zinc chloride to flow into the cylinder at a temperature of 170 deg. F. The pressure is then raised to 160 lb. per sq. in. and maintained for six hours.

The plant is operated by an engineer, an assistant engineer, a fireman and a helper, with an assistant engineer and a fireman at nights. The charges are changed at 6 a. m. and 6 p. m. Each charge consists of 15 trams, making it possible to treat 60 trams in 24 hours, with an average of about 2,800 ties.

The design of this plant was carried out under the direction of W. H. Courtenay, chief engineer, and the buildings were designed in his office under the direction of J. A. Galvin, architect. The general arrangement of the plant and many of the details, including the piping, were worked out by John B. Lindsay, superintendent of timber treating plants, who also has charge of the operation of the plant through his assistant, H. G. Laird. The grading and concrete work were contracted to the Meacham Contracting Company, Hopkinsville, Ky., and the track work and building construction were handled by company forces. The Allis-Chalmers Company, Milwaukee, Wis., furnished and installed the cylinders; the Henry Vogt Machine Company, Louisville, Ky., furnished the tanks, and all piping and valves were supplied by the Crane Company, Chicago. Engineer, J. M. Foley, of Birmingham, Ala., installed the pumps, piping, valves, etc. Work was begun on this plant in June, 1913, and it was open for operation on March 7, 1914.

A Simplified Method for the Location of Sidings

Several Typical Problems Together With Some Important Practical Considerations Regarding the Layout

By W. F. RENCH

Supervisor, Pennsylvania Railroad, Perryville, Md.

A supervisor frequently has need of a simplified method by which the curves of a siding may be laid out on the ground, either at the time the preliminary survey is made, with the object in view of showing the applicant for the siding the salient features of the location or of making notes necessary to an estimate of the grading, when a tape line layout may be the only one possible, or at a later time when the siding is about to be constructed and a transit may be unobtainable or its use inconvenient. Doubtless many cases require some instrumental work and it is then useful to know how the processes can be simplified, as the corps will generally consist of the supervisor or his assistant and a trackman or two.

It is thought that probably the greater number of cases of siding layout can be met by the use of the tape line alone. Most supervisors carry with them at all times a 5-ft. extension rule and a 50-ft. steel tape and not a few a 100-ft. length of string to correct the general line of curves. By the aid of the simple rules of geometry and with the use of the accessories mentioned, it is possible to dispose immediately of very many cases and often avoid the necessity of a subsequent visit to the location.

The matter is greatly simplified by the fact that the right of way line is nearly always parallel with the tracks and the building which fixes the location of the siding is also parallel. The siding therefore is either parallel or at right angles with the track. But even for those cases where the siding is not parallel or at right angles with a tangent main track a special solution is possible which is not unduly complicated and which can be comprehended by most maintainers of track.

It is not claimed that any new theories have been developed, but it is claimed that certain of the solutions offered are not to be found in any of the field books. Of the many which are to be found there only those have been selected which tend to simplify the supervisor's work and even to open the way for the safe handling of such problems by the brighter track foremen, not a few of whom are now entering the ranks of supervisor.

It will perhaps be thought by some that in neglecting the tangents introduced into the siding curve by the straight

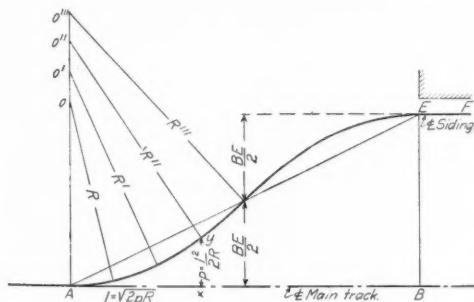


Fig. 1—A Siding Parallel to the Tangent Main Track

switch and frog accuracy is being sacrificed, but it will be found that for turnouts above No. 5 (and those below have been practically eliminated by the operation of the Safety Appliance law) no sensible error will result from this source. Stakes need not be set at either the point of switch or the point of frog, but their location should be indicated by marks on the rail and care should be taken that the half inch point of frog is always understood.

The simplest case is that of a siding parallel with a tangent

main track and flanking a building, the location of which fixes the maximum offset distance. There is no practical need nor is there usually the space for introducing any tangent between the curves, but in order to render the physical conditions at the point of reverse as favorable as at the beginning and ending of the curve, it is quite advantageous to make the curves flatter at the reversing point. This may be done by using the formulae for the parabola. While this increases the length of the curve somewhat, the extension is not more than a few feet even for an extreme case.

The formulae symbolized are $p = \frac{l^2}{2R}$ and $l = \sqrt{2pR}$, or expressed in words signify that for a chosen distance from the point of the curve along the tangent, the offset is equal to the square to the distance divided by twice the radius, or conversely, for a chosen offset from the tangent, the linear distance is equal to the square root of the product of the offset multiplied by twice the radius. The field books employ these formulae for staking out a circular curve by offsets from the tangent and chords produced, the value of the offset from the chord produced being twice that from the tangent, when the distance used is a chord of the curve instead of a length on the tangent. The method is undesirable because the operation of successively producing the chords renders the process subject to cumulative error.

By the use of the formulae in the manner suggested, the distance from the end of the curve to the reversing point and from the reversing point to the point of switch may be obtained at once. These distances will be equal if the two

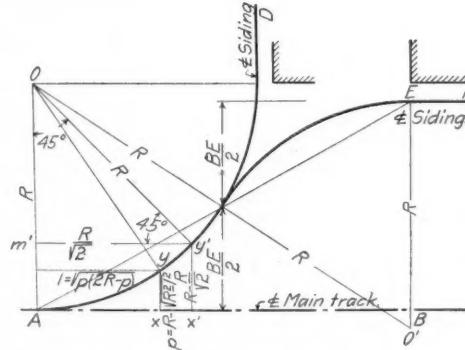


Fig. 2—A Siding Parallel to or at Right Angles to the Tangent Main Track

curves are of equal radii and the reversing point will be midway between the line of the main track and of the siding. Whether the curves be of equal radii or otherwise, this point will lie in the line joining the two tangent points. Any number of intermediate points on both curves may be set after computation of the offsets. Those for the second curve may be made supplements of the whole distance between the siding and the main track and thus all the measurements be made from an actual base line and every source of error in the field work be eliminated. It should be noted that the offsets vary as the square of the linear distance and if the distances selected are in a simple ratio, the square of this ratio multiplied by the first offset will supply the other offsets with a considerable saving in computation.

When the length of radius is not absolutely determined by

limiting conditions, as indeed seldom is the case, one should be chosen which will make the offset at the point of frog equal to the gage. This radius will be about 5 per cent larger than the actual radius obtaining through the lead, but this advantage is quite desirable both from the maintenance and operating standpoints. This solution may be used for the case of a crossover between two tracks which are parallel, but which are so far separated that a tangent between the frogs is impracticable.

If it is preferred to make the reversed curves circular rather than parabolic the formulae outlined for a continuous circular curve should be employed.

The problem of locating a siding at right angles with the main track may likewise be met by the use of offsets and with as great accuracy as the average transit instrument will supply. It is necessary in any event to adjust the detail line of the curve when finally laid, and this can best be done with a string. The formulae for offsets employed in the preceding case will not answer for the circular curve required and the proper formulae for such cases are the following:

$p = R - \sqrt{R^2 - l^2}$ and $l = \sqrt{p(2R - p)}$. These symbols signify that for a chosen distance from the point of curve along the tangent, the offset is equal to the radius minus the square root of the difference between the radius squared and the linear distance squared; or, conversely, for a chosen offset from the tangent, the linear distance is equal to the square root of the product of the offset multiplied by the difference between twice the radius and the offset.

This may be used for the offsets from either end to the middle of the curve, for which point it should be noted that the linear distance is equal to the radius divided by the square root of 2, which is 1.414, and the offset is equal to the difference between the radius and this linear distance.

A test of the correctness of the layout will lie in the fact of the total measured length of the curve agreeing with the length as computed by the simple properties of the circle.

The problem when the line of the siding either converges

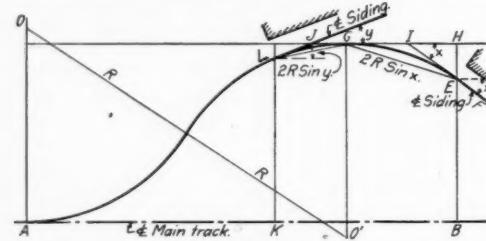


Fig. 3—A Siding at an Angle with the Tangent Main Track

toward or diverges from the line of the main track may appear to be quite complicated, but when understood becomes really quite simple. The field work necessary to a solution of such a case consists only in measuring the angle of divergence and the offset distance at the point of tangency. The problem then is to determine the position of a tangent parallel with the main track which, for the chosen radius, will make the curve pass through the point desired and be tangent to the line of the siding at that point.

The field books develop with great interest to the mathematically inclined the problem of finding the equal radii for a known position of the line joining the two ends of the reversed curve. But as the effect of such a proposition is to establish a curvature that will generally necessitate the use of special frogs it is clearly not of much use in the solution of the practical track problem.

The angle may be obtained with the tape line by laying down equal distances along the two sides of the angle and measuring the spread at the ends of such distance and by dividing the constant 57.3 by the ratio of these measurements, which it will be noted is the same problem as used in measuring the angle of a frog.

The length of chord subtending a central angle of this computed value may be found with sufficient accuracy by dividing the angle by the degree of curve. The tangent offset for this chord will be obtained from the formula in Example 1, and the linear distance by a solution of the right angled triangle in which the chord is the known hypotenuse and the tangent offset the other known side. The position of the parallel tangent and the linear distance to the point of curve are now

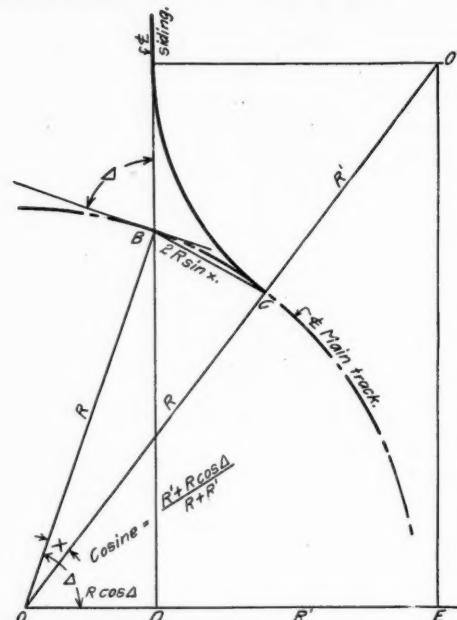


Fig. 4—A Siding from the Outside of a Curved Main Track

known and the solution of the problem becomes simply that of Example 1, except that for the diverging line a portion of the computed curve is imaginary and for the converging line a portion of the computed curve will be duplicated beyond the point of tangency with the imaginary parallel line.

The problem of establishing a connection from a curved main track requires instrumental work in measuring the angle between the siding tangent and the tangent to the main track curve at the point of intersection and of de-

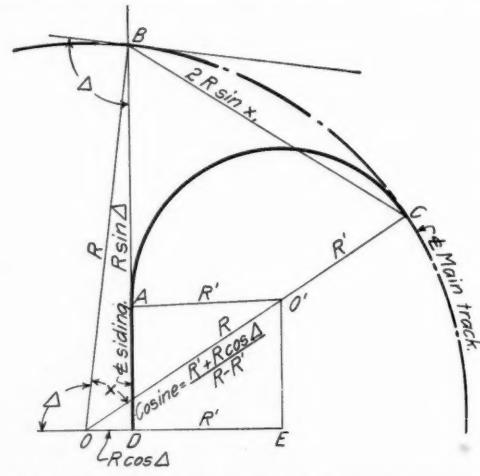


Fig. 5—A Siding from the Inside of a Curved Main Track

flecting for the several stations after computing the length of curve between the point of intersection and the p. c. of the siding curve and of the distance on the siding tangent between the main track curve and the p. t. of the siding curve. This distance from the main track curve to a possible point of tangent for the siding curve should be measured as a check on the selection of radius for the sliding curve. The choice of curves is limited to those which will permit the use of a

equals the overhang on curves that are without super-elevation. The corrections may be readily computed for cars with 30 ft. truck centers by taking one-fourth the degree of the curve as inches of overhang and assuming that the nosing is no more than that figure and adding or subtracting whatever may be proper for the super-elevation employed. If this is $1\frac{1}{2}$ in. as suggested, the tilt at the eaves of the car would add or subtract $4\frac{1}{2}$ in. from the correction depending on whether the low or high side were in question. The fact should not be overlooked that at the end of the curve a correction should also be made which is one-half that for the body of the curve. The distance beyond the point of tangency to the point where correction no longer applies is about 18 ft.

The overhead clearance limit is conveniently fixed at 16 ft. above the top of rail which meets the requirements of all present equipment and probably is ample for all future design. As this clearance will not pass a man riding a car, tell tales should be placed. The least overhand clearance that will safely pass trainmen standing upon the highest cars is 20 ft. 9 in. above the top of rail.

The considerations of alinement, grade and super-elevation are other important elements in a siding layout. As a general proposition, if space is available, no shorter radius should be employed than can be operated practically by any class of engine. For most roads this is the curve of a No. 6 turnout from tangent which is 23 deg. or 250 ft. radius. This requirement is not practical in congested districts and it will often be necessary to modify the curvature to the minimum that a due consideration for safety in coupling cars will permit. This radius has been variously determined, but probably is close to that of a No. 5 turnout from tangent or a 162-ft. radius. Where sharp curvature and maximum gradient are both involved insistence should be had upon the best possible feature for each.

The allowable maximum gradient for siding connections for the best service is 2 ft. in 100 ft. and the maximum for a track upon which cars stand for unloading 1 ft. in 100 ft. It is possible to operate sidings with a gradient as great as 4.7 ft. in 100 ft., but the best drill engines cannot handle more than three loaded cars on such a gradient and the operation is therefore unprofitable. The danger of wrecks from cars running away with the possibility of fouling the main line even when derails are provided renders such a gradient highly objectionable. It is very important that all radical changes of grade in siding connections shall be eased by vertical curves, as the absence of such advantage is a frequent source of accident.

The general feature of gradient concerns the approaches to coal trestles more particularly, and is one where the road must often take a firm stand against the insistence of the applicant for more headroom. The adoption of a limiting gradient by the road many times would supply the means of combatting such demands. If greater headroom is desired it can nearly always be had by excavating the site. Any less clear height than 6 ft. 6 in. below the stringers will not permit a horse being driven through and any greater headroom than 14 ft. will break the coal or grind a measurable amount of it into dust with a considerable loss to the dealer.

The question of super-elevation is one concerning which authorities differ. It will be argued that no super-elevation is possible through the connection and therefore none is necessary beyond the connection. But the difference is that the track through the extent of the switch timbers is more rigidly secured in line, surface and gage, if tie plates be used on the timbers as should be the case, and there is less chance for distortion. It will be found that a super-elevation of $1\frac{1}{2}$ in. for all siding curves is a decided maintenance advantage.

The importance of good line and surface is not fully appreciated. Very many obscure cases of siding derailment wherein the cause is given as "truck failing to curve" is really irregular line or uneven elevation. To spend money in siding maintenance is much better than spending it for small wrecks with its annoying interruption to drill work or the possibility of injury to men.

The best maintenance of sidings can only be attained by constant inspection and supervision. The track walker should go over every siding once every day. The foreman should inspect each siding in his territory twice a week. The supervisor should make a careful examination of his sidings and switches once every month and make permanent notes of what he finds. He should also require a report every two weeks from his foremen stating that he has made his inspection and calling attention to any specified repairs that may be necessary requiring material that he lacks. For the best results the foreman should not be overburdened with siding responsibility. Probably 30 switches is the most that one foreman can look after if he has main track duties also.

MOTOR CARS ON THE KATY*

By J. L. WALSH

Superintendent, Parsons District, Missouri, Kansas & Texas, Parsons, Kan.

In March, 1913, we were furnished 10 Fairbanks-Morse No. 32 motor cars at a total cost of \$2,444. In the 13 months these cars have been in service they have made 80,465 miles, consuming 2,701 gallons of gasoline at a cost of \$256.63, with oil and other supplies costing \$75.61—making 29.9 miles per gallon of gasoline.

When these cars were put in service on the Kansas City division the number of sections was reduced from 16 sections of six miles each, to 12 sections of eight miles each. During the 13 months ending June 1, 1914, our total cost of track labor on sections, including wages of foremen and laborers, was \$36,497.15, while for the 13 months previous to the use of these cars the expense was \$39,823.95, showing a saving with the cars of \$3,326.80. Deducting from this amount the cost of the cars leaves a net saving of \$882.30. It is, therefore, conservative to figure that our saving on the 10 cars now in operation will amount to \$3,000 per year.

This saving of \$3,326.80 has enabled us to maintain a tiling gang in maintenance work. Outside of the tiling gang the use of the motor car has enabled us to maintain the Kansas City division without the use of an extra gang, and we believe the track conditions on that division are considerably better than they were last year, even though our heaviest power has been in service on the division since May, 1913.

In addition to the real money saved in the operation of these cars, probably the largest saving is effected in going to and from work as under ordinary conditions the cars will make a speed of 20 miles per hour, enabling the men to start to work fresh from 30 to 45 minutes earlier than they would on the hand car, and permitting them to work the same length of time longer in the evening. The total saving thus effected is represented by 13,134 labor hours, amounting to \$1,970.10, which amount alone would pay for the cars in 15 months.

There are many instances where we have been able to double up section men for work that would ordinarily require an extra gang, and which would be very expensive if we attempted to double up gangs with the hand cars. As an instance of the value of motor cars, I will cite the case of a serious derailment which damaged the track and a high trestle. We were able to get four section and one bridge gangs to the scene four hours before the wrecker arrived, during which time the track and bridge were made safe for the passage of trains, so that we were able to open up the main line in one hour after the wrecker arrived, we thus saving a detour to one of our fast passenger trains which we would have had to make, had it not been for the motor cars.

Another great advantage of the motor car is the fact that we are able to keep a full quota of section laborers on each section, as the motor car relieves them of the hardest work trackmen are called upon to do. In the event of storms, the motor car acts as an incentive for section men to patrol their track, which

*An abstract of a paper presented at an operating department staff meeting held at Galveston on June 22 and 23, 1914.

otherwise might not be done. Another advantage is that the foreman can leave three of his men on a piece of work and go over his section with one man. The same is true in going after water, or material needed, all of which amounts to considerable saving when it is not necessary to use the entire gang.

These cars will accommodate 10 men, together with the track tools, and they have handled a push car with from 25 to 40 ties with comparative ease. With the aid of a push car we are able to handle 20 men in extra gang work, enabling the gang to get to work sooner, and work longer per day, thus saving many labor hours.

While the motor car promotes economy and efficiency in track work, probably a greater efficiency and economy obtains from their use by bridge gangs. We had in use by a bridge gang a Buda motor car No. 19 equipped with a free-running engine which gave perfect satisfaction. We found that it was possible to eliminate four moves of the bridge outfit per month, the average move being about 25 miles. As the outfit consisted of six cars, or about 150 tons, and as the transportation expense of handling freight on this district is 0.027 cents per ton mile, we were able to save on this item alone \$486 per year. A further saving of 20 hours each month to trains handling bridge material will amount to \$65 per month, or \$780 per year. With the aid of a motor car in a bridge gang, we can operate with one man less, making a saving in wages of \$648 per year, or a grand total of \$1,914 per year, while the cost of the car is a trifle above \$300. With the aid of a push car we can handle four 30-ft. stringers, together with the men and tools. A great deal of money was also saved by distributing gang over 20 or 25 miles doing small jobs that would be very expensive if handled in the old way.

RAIL FAILURES STATISTICS FOR 1913*

By M. H. WICKHORST

Engineer of Tests, Rail Committee, American Railway Engineering Association

This report deals with the statistics of rail failures for the year ending October 31, 1913, furnished by various railroads of the United States and Canada in response to a circular sent out by the American Railway Association. The information furnished by each railroad showed the number of tons laid of each year's rolling from each mill and the total number of failures that had occurred in each year's rolling from the date laid until October 31, 1913. Heretofore only the failures occurring in the year covered by the report were shown, but in this report the total failures occurring since the rail was laid are made the basis of comparison.

The tonnages of rail represented by these statistics are shown below:

Year rolled	Bessemer	Open-Hearth	Total
1908.....	282,945	156,120	439,065
1909.....	432,155	461,261	893,416
1910.....	564,713	828,111	1,392,824
1911.....	276,933	646,809	923,742
1912.....	80,146	939,025	1,019,171
1913.....	63,472	793,557	857,209

FAILURES CLASSIFIED BY MILLS

For the purpose of determining the failure performance of the rails furnished by the different mills, the statements were first grouped between Bessemer and open-hearth steel. They were then grouped by steel mills, and each mill's tonnages grouped by the year the rail was rolled. Totals and averages were obtained for each of these groups.

FAILURES OF BESSEMER AND OPEN-HEARTH COMPARED

Year rolled	Failures per 10,000 tons		Comparative failures	
	Open-Hearth	Bessemer	Open-Hearth	Bessemer
1908.....	268.9	302.1	100	112
1909.....	109.0	212.4	100	195
1910.....	57.6	132.1	100	229
1911.....	37.4	94.2	100	252

*Abstracted from Bulletin 170 of the American Railway Engineering Association, just issued.

The rails for 1912 and 1913 are not included in this comparison, as they are probably too young for the comparison to be as reliable as for the older rails. Comparing the different years, the failures per 10,000 tons of open-hearth rails are proportionately much larger for the year 1908 (approaching the number of Bessemer failures), and this suggests the thought that there were faulty practices in the early rollings of open-hearth rails that were improved upon in later years.

In order to show the relative number of failures from each of the mills and to show the ranking of the mills as regards the failure performance of the rails rolled by them, the following table has been prepared. Taking the average number of failures per 10,000 tons of all the mills in any year's rolling as 100, the relative number of failures of each of the mills is shown for the years 1908, 1909, 1910 and 1911. The later rollings are not included because of being too young.

Bessemer			Open-Hearth		
Mill	Rank	Relative failures	Mill	Rank	Relative failures
Maryland	1	56	Colorado	1	20
Cambria	2	71	Tennessee	2	26
Lackawanna	3	89	Lackawanna	3	52
Illinois	4	89	Pennsylvania	4	58
Carnegie	5	161	Maryland	5	76
Algoma	6	191	Carnegie	6	96
Average	100		Illinois	7	107
			Cambria	8	136
			Bethlehem	9	210
			Algoma	10	312
			Dominion	11	539
			Average	100	

The "100" given as "Average," it should be understood, is not obtained as the average of the column below which it appears, but is taken to represent the failure performance of the tonnage covered by these statistics of all the mills during the four years represented and for Bessemer and open-hearth rail separately. The "Relative Failures" give the number of failures that occurred in the same tonnage that had 100 failures as an average of the rails of all the mills.

A striking feature noticeable in this comparison is the very large differences between the different mills, especially in the open-hearth steel, some of which can be attributed, probably, to differences in the service to which the rails are subjected, but this can be only a partial explanation.

COMPARISON OF SECTIONS, WEIGHTS AND POSITIONS IN THE INGOT

A retabulation was made of all the failure reports with special reference to the matter of performance of different sections and was divided into three groups as follows: Thick base, high rails, or the A. R. A. type A group; thick base, low rails, or the A. R. A. type B group, and thin base, or A. S. C. E. group. The results indicate that the various types of section have about the same failure tendency, although on account of the differences in service no definite conclusions can be drawn as to the different types of section. The thin-base rails showed a somewhat larger percentage of failures as base breaks and broken rails, although the failures per 10,000 tons were about the same.

Comparisons were made of failures by weights of rail, but definite conclusions as to the failure performance of different weights of rail probably cannot be made from these statistics because of the difference of service to which the light and heavy rails are subjected. The comparisons indicate that the weight of rail per yard does not greatly influence the failures per 10,000 tons.

A comparison of the rails from the different ingot positions indicated that, as a general average, the failures classified as head failures of the "A," or top rail, were 2.7 times the failures of the other rails of the ingot in Bessemer steel and 1.8 times in open-hearth steel. In the failures classified as base breaks and broken rails the different rails of the ingot showed about the same failure tendency, or a little less in the "A," or top rail.

A comparison of rails made of steel treated with titanium with those of plain steel showed that in some cases the treated rails gave fewer failures per 10,000 tons than the plain rails,

and in other cases the plain rails gave the smaller number of failures. As a general average the titanium-treated rails gave somewhat less failures per 10,000 tons.

The tables showed that, after a period of service of five years, as a general average, about 1½ per cent of the rails were reported as failed.

ROADMasters' ASSOCIATION COMMITTEE ASSIGNMENTS

The following subjects for investigation on which reports will be made at the 1915 convention of the Roadmasters' & Maintenance of Way Association were selected at a recent meeting of the executive committee. The personnel of the committees assigned to this work are also given.

New and Experimental Track Accessories and Tools: William Shea (C. M. & St. P.), chairman, J. W. Dahl (N. Y. C. & H. R.), J. O'Connor (M. St. P. & S. S. M.), D. O'Hern (E. J. & E.), Emmet Keough (C. B. & Q.) and George Beckingham (G. T.).

Proper Organization of Section Forces and Methods for Maintaining and Policing Track. Sub-committee No. 1, For High Speed, Heavy Traffic Railroads: M. E. Eagan (N. Y. C. & H. R.), chairman, H. Ferguson (G. T.), A. L. Kleine (A. T. & S. F.), W. P. Murn (N. P.), J. E. McNeil (A. T. & S. F.), David Mau (C. M. & St. P.) and L. C. Ryan (C. & N. W.). Sub-committee No. 2, For Light Constructed Railroads Carrying Heavy Traffic: J. Buel (A. C.), chairman, J. W. Fletcher, Jr. (Car. & N. W.), William Wharry (G. T.), H. A. Buel (C. M. & St. P.), George Corcoran (C. & N. W.), E. W. Gulley (C. R. I. & P.), and B. F. Harrison (C. R. I. & P.). Sub-committee No. 3, For Large Terminals: G. H. Brooks (St. L. T.), chairman, David McCooe (G. T.), F. E. Crabbs (C. & N. W.), William Lawrenz (C. & E. I.), A. M. Anderson (C. M. & St. P.), J. P. Corcoran (C. & A.), M. Griffin (C. R. R. of N. J.), and T. F. Donahoe (B. & O.).

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since October 23, 1914:

Licenses for Engineers.—The arguments formulated by D. F. Crawford of the Pennsylvania Lines West against the bill for licensing engineers which is now being prepared by a commission of the Pennsylvania state legislature were commented on in an editorial in the issue of October 30, page 782.

The New Kansas City, Mo., Union Passenger Station.—The new passenger station used by all roads entering Kansas City, Mo., which has just been completed at a cost of about \$11,000,000, was opened for traffic on November 1. An illustrated description of this building and the accompanying facilities was published in the issue of October 30, page 799.

The Jersey City Passenger Station Improvements.—A unique problem in passenger terminal construction has been solved by the Central Railroad of New Jersey in the improvements recently completed at its Jersey City station, where all passengers are transferred between trains and ferry boats. A large increase in capacity has been secured by building a new two-story ferry house, enlarging the concourses and rearranging the station building. This work was described and illustrated in the issue of November 6, page 860.

Construction of the New York Connecting Railroad.—The 10-mile line which is being built at an estimated cost of \$30,000,000 to connect the New York, New Haven & Hartford in the Borough of the Bronx with a point in Brooklyn opposite the Greenville yards of the Pennsylvania for freight traffic and with the East river tunnel line of the Pennsylvania for passenger traffic, was described and illustrated in the issue of November 13, page 888. This line includes an arch bridge over the Hell Gate which is the longest arch span ever built, a considerable length of high viaduct, and other important structures.

NEW ALPINE TUNNEL PIERCED.—The last wall of rock was brought down in the tunnel from Montiers, in France, to Granges, in Switzerland, on the morning of October 28, the engineers from the two sides meeting at half-past four amid cheering.

AN UNUSUAL FAILURE OF A CREOSOTED PILE

In the construction of a turntable in the Brownwood, Tex., division yard of the Gulf, Colorado & Santa Fe recently, it was thought advisable to drive piles under the foundation as there was no rock within reach. This yard is laid on a fill of 5 to 8 ft., the natural surface being bottom land which proved to be very compact and to offer great resistance to the driving of the piles. The piling furnished for this work was removed in 1913 from the Galveston bay bridge, where it had been driven in 1895. The timber was long leaf yellow pine which had been preserved by the marine treatment, consisting of steaming and the injection of 24 lb. of creosote per cu. ft. When this bridge was dismantled the best of the piles were pulled and saved.

These piles failed during driving at Brownwood and were later dug out and replaced by concrete. The condition of one of these piles after its failure is shown in the accompanying photo-



Creosoted Pile that Failed by Brooming About 3 ft. from the Point

tograph. The point bears practically no evidence of battering, although at a distance of about 3 ft. from the point the wood fibers have been distorted, splintered and compressed longitudinally until the diameter was increased to nearly 4 ft. This tearing of the fibers shows that the preservative treatment was of the best, and the condition of the wood as to decay has remained excellent. The only plausible explanation of the failure is that the pile penetrated the natural ground for the length which is undamaged, and that the failure occurred at the level dividing the ground and the filling material.

THE TRANS-AUSTRALIAN RAILWAY.—The latest report concerning the East to West Transcontinental Railway which the Australian government is constructing between Port Augusta in South Australia and Kalgoorlie in Western Australia shows that 231 miles of earthworks have been completed and that the rails have been laid for 225 miles.

Constructing Embankments with Suction Dredges

The Burlington Has Constructed Three of these Large Dredge Outfits to Rebuild Line Along the Mississippi

The Chicago, Burlington and Quincy is now engaged in the reconstruction of its line and the building of a second track between Savanna, Ill., and St. Paul, Minn., a distance of 280 miles. This line follows closely the east bank of the Mississippi river for the entire distance and for the greater part of the way is closely hemmed in by high bluffs on the east and by the river on the west. It was built in 1885 with a maximum grade of 0.3 per cent and maximum curve of 3 deg. In reconstructing this line the grade is being reduced to a maximum of 0.2 per cent and the curvature to 1 deg. While the reduction in grade has not introduced any serious problems, the establishment of this low standard of curvature has made necessary some very heavy grading work.

Since the old 3-deg. line followed the river closely it is evident that a 1-deg. line must either cut heavily into the projecting bluffs or cross the numerous bays of the river. The decision between these alternative locations depended largely on the type of construction equipment to be employed. After making detailed surveys, the river line was adopted. The work has been carried on continuously since 1910 until now the second track is about half completed. It is costing from \$25,000 to \$75,000 per mile and will require the expenditure of about \$13,500,000 for the entire line.

Over 12,000,000 cu. yd. of embankment lies in the river or immediately adjacent to it in addition to the excavation and

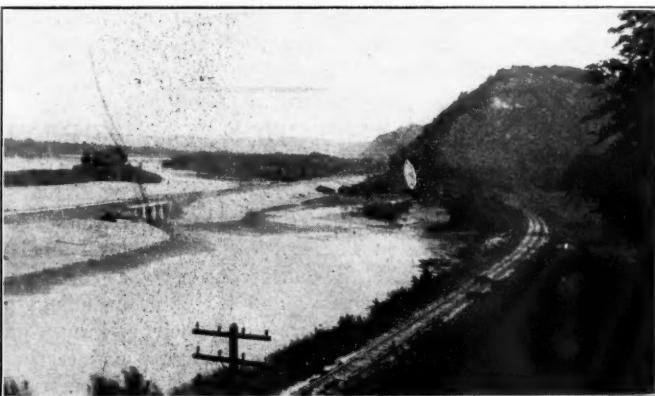
bottom gives out or is exhausted. Under good working conditions about 20 per cent of the material pumped consists of solids, while about 35 per cent of the working time of the dredges is consumed in necessary delays.

Another factor limiting the output is the length of the discharge line. While this naturally depends on the distance from the beds of good material to the bank, it is kept under 2,000 ft. whenever possible, although the 20-in. dredge has pumped through a line over 3,000 ft. long. When starting work at a new



Completing a 300,000 cu. yd. Embankment at Lynxville, Wis.

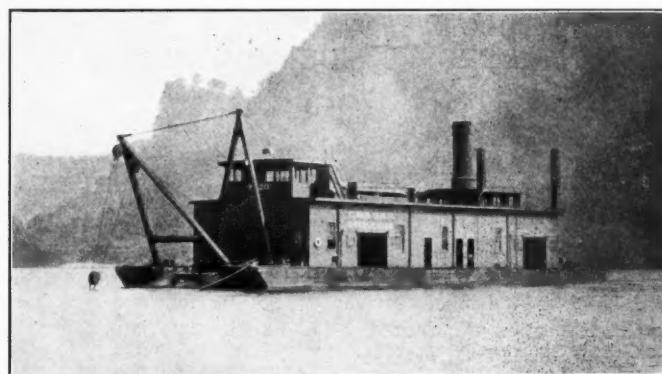
location the discharge is directed on the center line of the proposed embankment until the fill appears above the water, when the discharge end of the pipe line is turned lengthwise along the bank and the water is conducted over the end to give the material an opportunity to deposit, the end of the bank being built ordinarily on a 6:1 or 8:1 slope. The sides of the bank are built to the desired slope of 2:1 by the use of sheet iron shields 10 ft. long and 24 in. high. As the bank is brought to the desired grade it is leveled off by the bank gang during the intervals when the dredge is not working. No side or top shrinkage is added since the material is deposited wet. These embankments are being built 34 ft. wide on top for double track. As they are completed, track is laid along the outer edge and the outer face, which is exposed to wave action of the river, is pro-



The Old Line and a Completed Cut Off Built by a Dredge

other embankment work on the main land. This large amount of river work has prompted the construction of three complete suction dredge outfits by the railroad, which are now being operated by its own forces. The first one with a 15-in. suction pump was completed and placed in service in 1910 and was described in the *Railway Age Gazette* of August 25, 1911. The following year an 18-in. dredge of the same general design was built, while the third, with a 20-in. pump, was placed in service last year. Considerable dredge work is also being done by contract. As these three company dredges have all been in operation for more than one entire season, it is possible to gain a fairly accurate idea of their performance.

The first essential for economical dredge operation is good material to handle. Mud or very fine sand deposits slowly on the bank and a large portion is carried off with the water, while coarse sand or gravel is readily retained on the bank. Accordingly the river channel or slough adjacent to the work is first sounded to determine the character of the material in the bottom. The dredges are then located where they may secure the greatest proportion of heavy materials, readily working down stream as the embankment is completed and the material in the river



The 20-in. Suction Dredge

tected with a 3-ft. coating of riprap or bluff debris loaded in the vicinity by steam shovels.

Another source of delay is occasioned by the necessity of moving the dredge as the material is exhausted. The 20-in. dredge can reach 37 ft. below the surface of the water and can pump within a radius of 250 ft. without stopping operations. Beyond this distance pumping must be stopped while the boat is being moved.

These dredges were formerly operated with two 12-hour shifts, although the shifts have since been reduced to 11 hours to enable minor repairs to the dredge to be made without the resulting

delay to the men. The regular force employed on each shift on the 20-in. dredge consists of a foreman, 6 men on the dredge, and 15 men on the bank. The bank, pontoons and dredge are lighted at night by electricity generated by a steam turbine driven dynamo on the boat.

While it is difficult to compare the yardage of material handled by these dredges because of the influence of local conditions of material, length of discharge line, size of embankment, etc., the performance of last year is fairly typical of the results which have been secured. Two sets of yardage figures are kept. The gross yardage is estimated and includes all material pumped, while the net yardage only includes that between the specified slopes. It is found that the gross yardage normally exceeds the net by about 30 per cent, owing mainly to the amount of material deposited outside the slopes and principally below the water line where the sand assumes a slope of 3:1 or even flatter. The 20-in. dredge, working in poor material, pumped 445,000 cu. yd. gross measurement or 316,000 cu. yd. net measurement in 149 working days last year or an average per day of 2,100 cu. yd. net. The corresponding total net yardages for the 15-in. and 18-in. dredges working 174 and 187 days, respectively, were 362,000 and 507,000, making a total net yardage for the three dredges last year of over 1,185,000. The total net yardage of the three dredges this season up to September 1 is 800,000. One of the accompanying photographs shows the 20-in. dredge 2 miles north of Lynxville, Wis., before the discharge line and pontoons were in place, preparatory to starting work on a 400,000-yd. embankment, while another shows the 18-in. dredge completing a 300,000-yd. embankment at Lynxville, Wis.

The most important advantage of the dredges for this work is the reduction in cost of the yardage handled. The cost of building a construction trestle and bringing material in by steam shovel and work trains would have made this location prohibitive in cost and would have required that the line be located closer to the bluff with the resulting difficulties with rock slides, bluff debris and storm water. As handled at present the dredges are depositing the material from 25 to 50 per cent cheaper than it could be placed by steam shovels on a line located for steam shovel work. Other advantages are that no work trains hauling material are required on the main line while the ballast is not damaged by the dropping of sand or dirt from passing construction trains. Also, more yardage can be deposited in a given time in this way than by steam shovels, while there is no shrinkage or settlement of the banks.

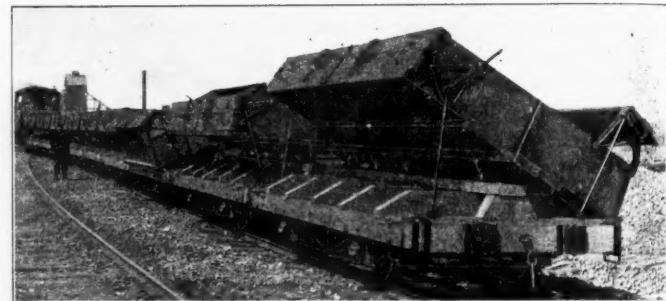
AN IMPROVED SIDE DUMPING CAR

A wooden side dumping car that has been under development in the shops of the Hecla Mining Company for the last two years, and used on the Calumet & Torch Lake Railway for one year, has been placed on the market by the Calumet Car Company, Houghton, Mich. The car, as it is now built, has a capacity of 9 cu. yd. It is 17 ft. long from coupling to coupling, and weighs 10,500 lb. It is of simple construction, which reduces both the original cost and the maintenance. Several of these cars have been in constant use from 6 to 12 months, and it is said that no repairs have been necessary.

The truck of this car is of the ordinary four-wheel type with a spacing of 7 ft. 6 in. between axles. The frame is of wooden construction and supports a central longitudinal bar 4 in. by 11½ in. in section and 14 ft. 10 in. long, to which the body of the car is fastened and about which it rotates in dumping. The body is 8 ft. 8 in. wide, 14 ft. long and 20 in. deep. The angle of repose of the car when in the unloading position is 30 deg., which was found from experiment to be sufficient for the easy discharge of coarse material. It is planned, however, to adjust the height of the car to the required angle for easy and quick discharge of any class of material.

The side boards are fastened to the ends of the body by sector shaped castings in such a way that they are pushed out-

ward and upward when the car is dumped, affording ample room for discharging the load and eliminating all friction between the load and the side board. The side board is held up in dumping by vertical rods attached to the frame, as shown in the illustration. The end boards of this car are beveled and the side boards fit up snugly when in normal position. One man can operate the car. The lever that holds the car in normal position is equipped with a locking device which prevents it from being jarred out of place and permitting the car to be dumped thereby. There is also an automatic locker on the side to prevent any portion of the load escaping while the



A Train of Calumet Dump Cars

car is in its normal position. Another improvement on this car is the automatic locker for holding the load bed in a tilted position while dumping. This device consists of catch hooks fastened to the under side of the body, opposite hooks being connected by an operating rod and spring which holds them in a position to engage with keepers that are fixed to the frame, when the car is tilted to a dumping position. This is useful when the material is moist and does not run out readily. It is also planned to construct the frame of the car of steel and to use air for unloading.

ANNUAL TRACK INSPECTION ON PENNSYLVANIA LINES

The annual track inspection of the Pennsylvania Lines West of Pittsburgh was made on Tuesday, Wednesday and Thursday, October 6, 7 and 8, inclusive. The inspection party, as customary, consisted of the general manager and his staff, including the chief engineers maintenance of way and their assistants, the general and division superintendents, the division engineers, assistant division engineers and supervisors of the system, traveling on six special inspection cars. Meals were served in special commissary cars at stopping points en route and sleeping car accommodations requiring three trains were carried for the entire party. The inspection covered the main line of the Fort Wayne from Pittsburgh to Chicago and of the Pan Handle from Chicago to Pittsburgh.

The first prize for the best supervisor's subdivision, based on line and surface, was awarded to Charles McCarthy, supervisor of the Logansport division at Union City, Ind., while the prize for the best supervisor's subdivision based on all points was awarded to Simon Clary, supervisor of the Pittsburgh division at Carnegie, Pa. The prize for the best track foreman's section, based on line and surface, was awarded to P. S. Crawford, section foreman on Mr. McCarthy's subdivision of the Logansport division. In addition to these three prizes, others were awarded to the track foreman on each supervisor's subdivision having the best section, based on all points.

THE SHANTUNG RAILWAY OF CHINA.—It is officially announced in Tokio that the Shantung Railway, which has been in the hands of the Japanese since the beginning of October, is still in their control, despite constant Chinese efforts to effect a dislocation.

A Discussion of the Common Forms of Rail Failures

Describing the Various Types of Failures Generally Encountered With Their Causes and Means of Detection

BY F. E. WEYMOUTH

Engineer of Tests, Maryland Steel Co.

The logical classification of rail failures seems to be one that places them under headings descriptive of the manner in which the failures develop or occur in service. A classification of these various types leads naturally into a study of the causes. A description of the *causes* of rail failures, however, involves a detailed study of each failure, and it is usually the case that two or more causes contribute to the ultimate failure of the rail in service.

CRUSHED HEAD FAILURES

Under this heading are placed all rails that indicate a "flattening" of the head or a breaking down of the head structure.

This type is sometimes given the term "split head" as are many of the "crushed head" rails from which a piece has been split off. Rails with this type of failure are also very frequently termed "piped" rails by the trackman. While the term "piped" may serve the trackman very well, it suggests that this type of failure comes from the presence in the rail of unwelded surfaces of an original cavity (called a "pipe") of the ingot. If this were true the term "piped" would be preferable to "crushed head," but very few failures are traceable to this cause.

"Crushed head" rails in track are readily detected in three ways. First, the widening out of the head is very apparent in track. Second, a dark streak appears in the center of the top of the head of the crushed portion, indicating that a portion of the metal is depressed and is not receiving the usual brightening from the wheels. Third, the distortion or breaking down of the head structure can be detected by a fishing template or by the appearance of a rust streak under the head. This type of failure develops very slowly in service and can be readily detected in its earlier development.

The question naturally arises, Does this type of failure occur in unsegregated steel? and our answer must be, "unfortunately yes." To investigate this type of failure a machine was designed at our plant with the purpose of reproducing the condition of the wheel loading that we get in service. Unsegregated rails have been tested in this machine and it has been found possible to develop "crushed heads" in any rail. The rapidity with which the crushing develops under this test is dependent upon the weight applied and the number of passes given.

To further answer this question of the occurrence of "crushed heads" in unsegregated steel, we can refer to the reports covering the rail failures on all the principal railroads of this country. Of 3,864 rails that failed from "crushed heads," 2,398, or 62.06 per cent, were from the top portion of the ingot, where we may expect segregation, and 1,466, or 37.94 per cent, were from the center and lower part of the ingot, where there is no segregation.

Mention was made of the misuse of the term "pipe." A "piped" rail is one in which the sides of the original shrinkage cavity (called a pipe) in the ingots are found pressed closely together in the rail. Cutting open the section we find that the walls of the cavity are not granular, but smooth, thus showing clearly that these two surfaces have always been separate and distinct.

Another means of differentiating between true pipe rails and true split heads is in the location of the opening in the rail. The opening of a split head is almost always confined to the head, while a true pipe is confined to the web, extending very little into the head. In some few cases we find a true split head running into a pipe, but these cases are very rare indeed.

FLOW OF METAL

This term is used to describe rails that show a "rolling out" or flowage of the top metal of the head toward the sides, without a breaking down of the head structure. Flowage of the top metal occurs in many different forms. The most prevalent failures of this type are those rails that show flowage at the ends of the rail. While it may be true that under severe traffic conditions the design of the joint is of great importance, our observations have been that by far the great majority of failures of rails at the ends are due to loose bolts at the joint.

One of the most annoying types of "flow of metal" to the trackman who desires a smooth riding rail is that which has been given the term "flowed in spots." A sloughing off of the top metal in several spots with the subsequent breaking off of the flowed metal causes what is sometimes called "roaring" rails. These spots appear on the gage corner of the head. A satisfactory explanation of this type has not been evolved, but intense localized wheel pressure which stretches the metal beyond the elastic limit is one of the main causes.

The effect of slipping drivers and of sliding wheels is very marked in the development of rails that fail from "flow of metal." In both cases the top metal of the head is overheated and cooled quickly in the same manner that a piece of steel is hardened by heating and quenching. Failures of rails from "Flow of Metal" cannot be classed as being in any way dangerous failures, but may be a starting point for the development of splits and breakages.

BROKEN RAILS

Under the heading "Broken" rails we include all rails that show cracks or splits of any kind, as well as those rails which have broken across, separating them into two or more parts. "Broken" rails are the most important class in our study of rail failures, since it is the rail that gives way suddenly in track that is the most dangerous.

In looking over the statistics of wheel loads for the last few years, and comparing them with the number of flange breaks, we find that the increase in "flange breaks" goes hand in hand with the increase in wheel loads. By "flange breaks" we mean the breaking out of a piece of the flange, usually over a support. These pieces usually take the shape of a crescent and are often termed "crescent shaped flange breaks."

It has been stated by some investigators that at least 60 per cent of all rails that failed from breakage across the section are the result of flange breaks. Some go even further and give 90 per cent, but while our investigations do not show as high a percentage as 60 per cent, it is important to note that flange failures will undoubtedly greatly weaken the rail section, and we may expect breaks across the section at any point where the rail section is so weakened. Failures of this type are due to one part of the flange carrying more of the load than the other part; in other words, by an uneven bearing of the flange of the rail.

The claim is often made that flange breaks are the result of lack of transverse ductility in the rail accompanied by the presence of seams. We must remember that a rail is one of the rolled shapes which does not receive any rolling in the direction at right angles to its length. The crystals or grains are elongated and knitted together in the direction of rolling, while the cohesion between the crystals or grains transverse to the rolling is necessarily less. This lowering of the ductility when we break a rail in the direction of its length is a natural consequence

*Abstract of a paper presented before the New England Railroad Club on November 10, 1914.

of its manufacture, and its tendency to cause flange breaks must be overcome by some other means than changing the method of rolling.

Seams are very prominently mentioned by some investigators as the main cause for "flange breaks." A critical examination of a large number of "flange breaks" shows that many of these pieces do show distinct seams, while in many others the seam would only be visible under a microscope, and in very many cases no seam whatever is present. Seams are elongations of small cracks formed in the early passes in rolling the ingot, and even with the utmost care and best practice known, they are bound to occur in the steel. It is safe to state that no rail has ever been rolled by any manufacturer, at any time, that was absolutely free from seams.

Maintenance conditions play a very important part in the occurrence of breaks across the section. The surface or vertical alignment is of utmost importance. Weights and speeds of locomotives and the method in which these weights are imposed upon the rail are also important factors in the stresses in rails.

Within the last few years a type of failure called the "transverse fissure" has come to our notice. This name is given to a fractured rail section that shows smooth dark or silvery spots in the head, while the rest of the metal is granular. In track this type of failure seldom gives any warning. The "transverse fissure" is found on the fractured surface usually without any connection with the outside skin of the rail, indicating that it is an internal fissure that radiates from a nucleus. No satisfactory explanation of the cause has as yet been evolved. As yet "transverse fissures" have not been found in rails that have

not been in service. They occur, for the most part, on the gage side of the head, indicating that they are developed at the places of greatest strain. The large majority of these failures occur in steel that is high in carbon. Failures of this type are not confined to any process of manufacture, or to any one mill, but some mills are practically free from these "transverse fissure" rails.

BREAKS IN WEB

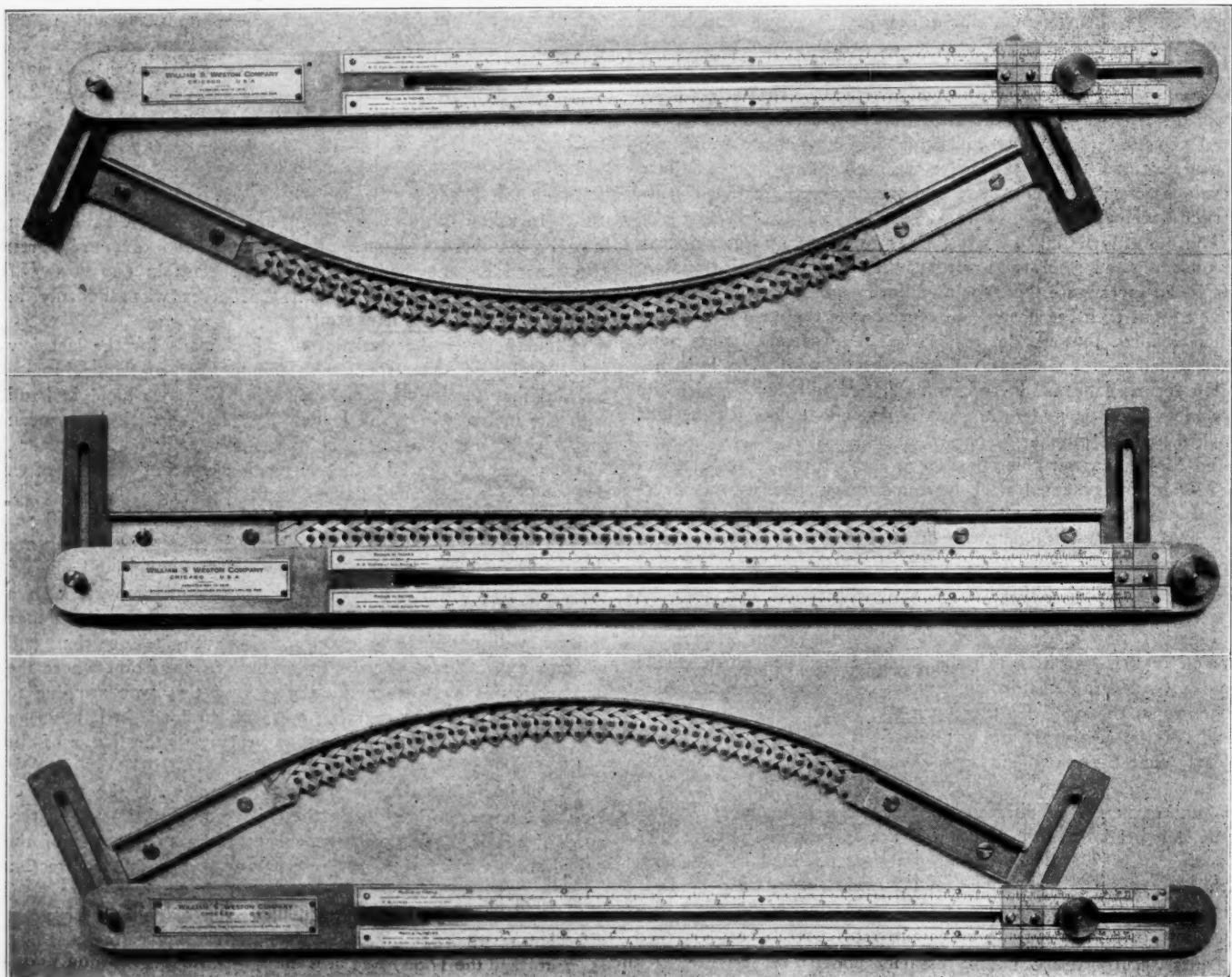
Breaks in the webs of rails usually occur at the bolt holes.

By far the majority of the breaks occurring at bolt holes are due to loose joints. When a joint is allowed to become loose a leverage is set up, which, combined with the severe blow due to the joint being loose, may easily cause the breaking out of a piece, or a longitudinal split in the web. It is the writer's opinion that low joints due to loose bolts contribute more broken rails at the bolt holes than any other one cause.

Very rarely we find cracks occurring longitudinally in the web at the bolt holes. The cause of this occurrence has not been satisfactorily explained, but blows from a spike maul, and excessive alternate bending, either in cold straightening or in track, may be contributory causes.

AN ADJUSTABLE ARC RULER

A new drafting instrument known as the adjustable arc ruler has been patented and is now on the market which is intended to replace an entire set of curve templets commonly used in railway drafting offices. It is designed for drawing



The Concave, Straight and Convex Positions of the Adjustable Arc Ruler

short arcs of circles of any radius over $3\frac{1}{2}$ in., and can also be used to draw long arcs, replacing a beam compass, by locating auxiliary points on the curve not farther apart than the length of the instrument, through which successive sections of the curve can be drawn. It is claimed that the instrument is accurate for all practical requirements little short of the limit of hair line tests with a rigid compass.

The instrument can be used with either a concave or convex ruling edge, as shown in the illustrations, a change from one form to the other being made by sliding the scale bar and its bearings in the slots in the T-shaped end plates from one limit to the other. This shifting of the scale bar can be easily and quickly accomplished with the thumb and index figure of each hand as a preparatory movement in the act of setting the gage plate of the scale to the radius required. The scale bar carries separate lines of graduation on highly polished celluloid for the convex and concave ruling edges so arranged that the scale to be used is always the one nearer the ruling edge.

The lattice shaped curving member, which in the instrument now on the market is 10 in. long, maintains the regularity of the curve automatically by a mechanical movement. The fundamental principle of this construction is illustrated in the ac-

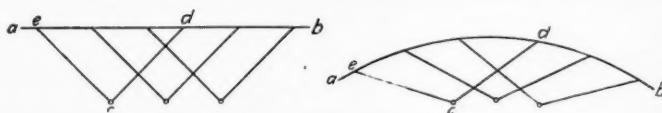


Diagram Illustrating Construction of Arc Ruler

companying diagram. The flexible curving member consists primarily of two light steel ribbons about as heavy as watch springs placed edge to edge, a series of inclined arms attached rigidly to one ribbon, a series of oppositely inclined arms attached to the other ribbon and pivotal connections between the free ends of the oppositely inclined arms.

The line a-b in the first figure represents the steel ribbons one above the other, the line c-d inclined to the right, represents arms rigidly attached to the upper ribbon, while the line c-c inclined to the left represents the arms attached to the lower ribbon. The ribbons are free to have a relative longitudinal movement. When the instrument is adjusted for a convex curve as in the second figure, the upper ribbon is moved toward the right so that the bases e-d of the triangles e-c-d are all an equal amount longer than in the first figure, and as the arms are rigidly attached to the ribbons, the latter are necessarily curved. As the arms are all of equal length, the relative movement of the ribbons produces a uniform change in all the triangles and accomplishes the automatic regulation of the curvature. With the exception of the steel ribbons the instrument is almost entirely of German silver. It is being manufactured and is for sale by the William S. Weston Company, 1431 Marquette building, Chicago.

A CORRECTION

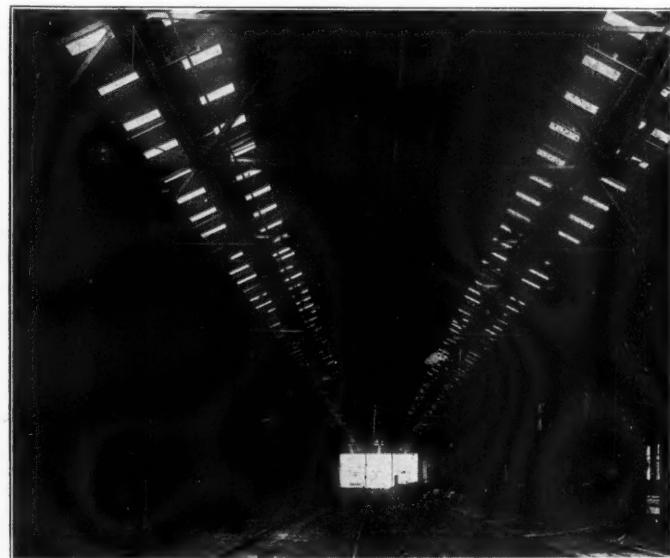
In the article entitled "The Present Status of Ferro-Titanium in Rail Manufacture," published on page 750 of our issue of October 23, the statement was made that only one heat out of 31 treated with titanium and tested for segregation exceeded the maximum limit of 12 per cent, fixed by an important eastern road. In the same sentence, however, it was stated that the maximum variation in the 31 analyses was 11.5 per cent, which proves the inaccuracy of the statement which followed. In the earliest reports of these tests, from which the article was first written, this maximum variation slightly exceeded 12 per cent. When the figure was corrected later we omitted to strike out the remainder of the sentence, although this doubtless caused little misunderstanding on the part of careful readers.

The concluding sentence in this article, stating that the results secured were not necessarily conclusive because of the small number of rails available for comparison, was also liable

to misinterpretation, as it referred only to the Santa Fe tests, while the other tests referred to were more comprehensive, and therefore more conclusive.

CEMENT TILE ROOFING

A large installation of cement tile, which illustrates well the adaptability of this type of roofing to special forms of construction and to harmonious effects with elaborately planned architectural details, is a feature of the new Union station at Kansas



Interior View of a Building Lighted by Wire Glass Insert in Federal Cement Tile

City, Mo. Approximately 1,000,000 sq. ft. of surface has been covered by this tiling in the new building and train shed, a special plant being built at Kansas City to manufacture the tiles.

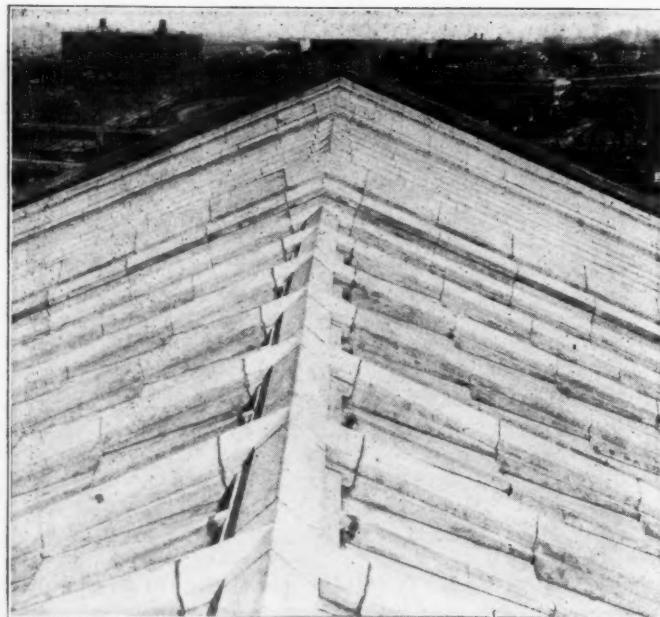


Portion of the Train Shed at Kansas City Station Showing Vertical Tiles Along Right Side of Smoke Duct

The details of the tiles used on the building were designed by Jarvis Hunt, the architect who prepared the plans for the station, the object being to secure the effect of a cut stone roof. This effect was further obtained by making the tiles of a gray color, instead of the red ordinarily used, in order to match closely the sandstone walls of the building. As the station roof is pitched, no waterproofing coat over the tiles was necessary.

In the construction of the train shed, tiles 1½ in. thick, 24 in. wide and about 7 ft. high were placed vertically along the edges of the 15-ft. 6-in. opening over each pair of tracks. These tiles are supported by lugs on the outside resting on the roof. A portion of the roof over these sheds is also covered with cement tiles about 24 in. by 48 in. in size, covered by a composition roofing.

This installation was made by the Federal Cement Tile Company, Chicago, sub-contractors under the George A. Fuller Construction Company, Chicago. The former company has placed cement tile roofs on many important buildings, including a number for railway companies, which are reported to be giving very satisfactory service. The standard red tiles for pitched roofs are made by a special process which combines other ingredients with Portland cement to form a material which it is claimed is waterproof, fireproof, and not subject to corrosion from sul-



Portion of the Roof of the Kansas City Station Building Showing Special Cement Tiles Designed to Imitate a Cut Stone Roof

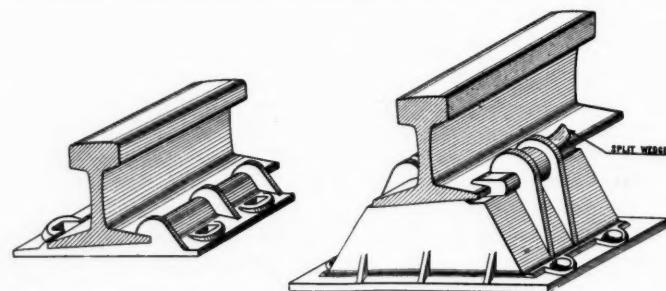
phurous gases. Each tile covers an exposed surface 24 in. by 48 in., and is ½ in. thick. The reinforcing metal is carefully imbedded in the cement to prevent corrosion. The tiles interlock by means of lugs on the underside and are joined by an adjustable roll sealed with elastic cement. Federal tiles for pitched surfaces are also made with an insert of wire glass 12 in. by 24 in., which interlocks with the standard red tile for top lighting. An installation of these tiles is illustrated herewith.

In addition to the advantages of permanence and absence of maintenance costs, the use of cement tiles effects a saving in steel construction to support the roof, which in the case of the Kansas City installation is estimated at 25 per cent as compared with a solid concrete slab roof.

One of the important large installations of these tiles on railway buildings is at Gary, Ind., on the general shops of the Elgin, Joliet & Eastern. Eight buildings, including the locomotive and car repair shops, paint shop, oil house, machine shop, power house, etc., were covered with Federal cement tiles six years ago, and the roof is reported to be giving the best of satisfaction now.

A CANTED RAIL BRACE AND TIE PLATE

To eliminate the necessity of elevating the outer end of the tie and the shoulder of the roadbed on curves, the Track Specialties Company, New York City, is now placing on the market a canted brace plate and tie plate. With this device all ties are laid level in the ballast and the outer rail is elevated the desired amount on curves by means of this type of chair, which is securely fastened to the tie by spikes and

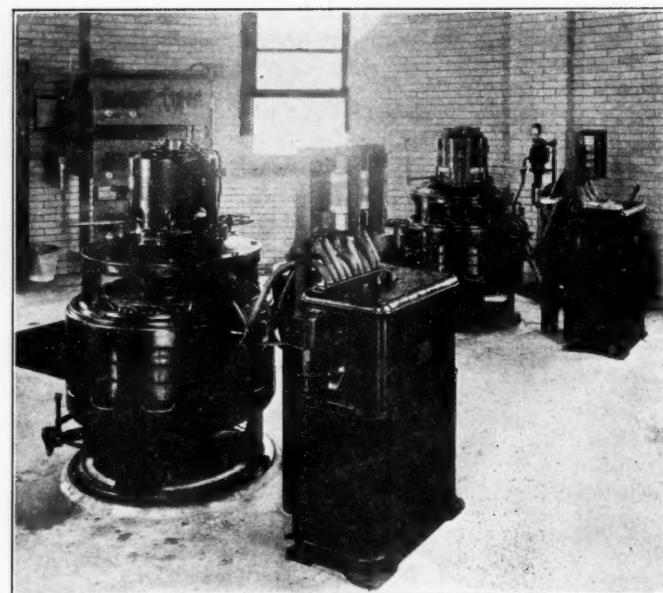


Two Types of Canted Rail Braces and Tie Plates for Different Degrees of Super-Elevation

which in turn holds the rail by means of a split wedge. These chairs are made in varying heights to give the desired elevation for any degree of curve and speed of trains. They are also designed for all standard rail sections. The wedge holding the rail is driven against the traffic to retard creeping. These plates are made of malleable iron.

A UNIQUE PUMPING STATION

An automatic pumping plant has recently been completed by the Pittsburgh, Fort Wayne & Chicago at Verner, Pa., to supply water to the railroad shops at Washington avenue, about a mile away, and to the locomotives and the passenger station at Federal street in the old city of Allegheny. The plant is unusual in the construction of the pump house, and in the fact that



Interior of Pennsylvania Pump House Showing Motors and Controllers

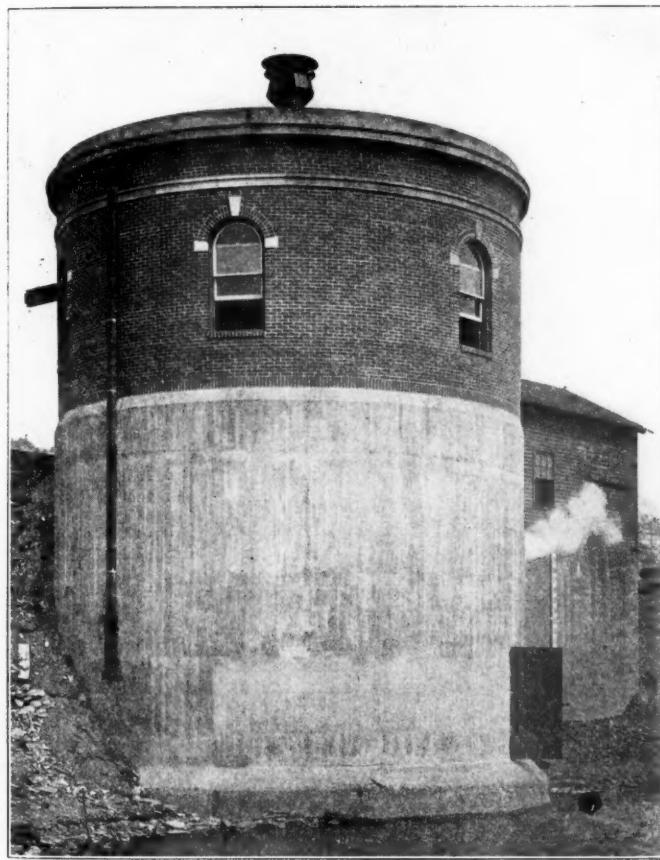
the three rotary centrifugal pumps which it is equipped have a larger capacity than any similar pumps heretofore installed by the Pennsylvania Company.

The station is located on the bank of the Ohio river. The pump house is a brick structure, circular in shape and 32 ft.

in diameter, with foundations of reinforced concrete surrounding a water well. This foundation is 40 ft. in diameter, and was sunk to rock 24 ft. below the water level in the Davis island pool. The foundation, which is in reality a concrete caisson, was sunk in a single piece, being fitted at the bottom with a steel cutting edge and loaded with 1,000 tons of rail. Under the circumstances a cofferdam could not have been constructed in this location. Cast iron gratings are placed in the walls of the concrete substructure to admit water.

An intake crib 96 ft. long and 16 ft. wide, made of 2 in. by 12 in. planks, was sunk in the river and filled with gravel to act as a filter for the water passing into the intake pipes which lead to the pump house. The bottom of the crib is 21 ft. below pool level. Two 24-in. intake pipes are provided, which were assembled on shore and floated into place. In order to accomplish this, the ends were plugged with wood in order to make the pipes watertight, and when they had been floated into position, water was permitted to enter through a hose until the pipes had sunk to the bottom of the river. The wooden plugs were then removed by a driver.

The three electrically operated centrifugal rotary pumps each



Circular Pump House on the Ohio River at Verner, Pa.

have a capacity of 1,000,000 gal. of water a day. Two of them will be used continuously, the third being held in reserve in case one of the others should be out of service. Space is provided in the pump house for two additional pumps if they are required. The electric power used to drive the pumps is transmitted from the Washington avenue shops. The motors are direct connected to the pumps by vertical shafts, being set above high flood water line, 26 ft. above pool level. The pumps are located a few feet above pool level, being submerged during floods and operating equally well whether submerged or not. They are driven at a speed of 1,200 revolutions per minute.

The water is pumped from the station through a 14-in. supply pipe to two 100,000-gal. steel tanks on the bluff about 300 ft. above the pumps. The starting and stopping of the pumps is

controlled by an automatic electric device depending on the elevation of the water in the tank. The cast iron supply pipe on the hillside is now being encased in concrete, this work being made difficult by the rocky, precipitous face of the bluff. The distributing pipes from the tanks are 12-in. cast iron.

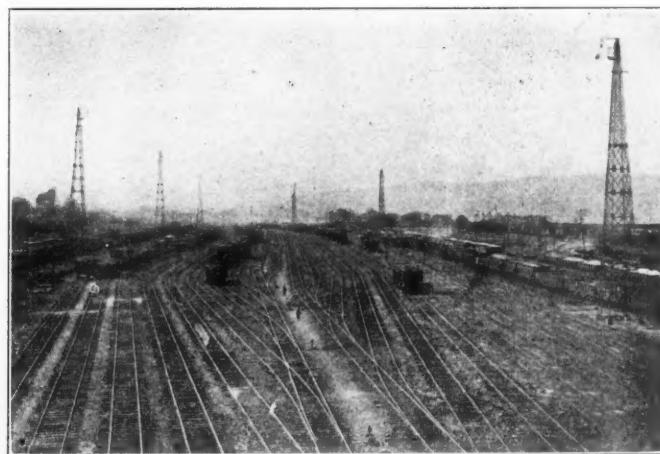
The entire work of building the pump house, crib, tanks and pipe lines was handled under the supervision of R. Trimble, chief engineer maintenance of way, Northwest System, and the pumping machinery was designed and installed under the supervision of T. W. Demarest, superintendent of motive power.

P. & L. E. CLASSIFICATION YARD LIGHTING

The lighting of a classification yard presents a special problem because of the long, narrow lanes between rows of freight cars, which are darkened by shadows unless the light is properly dispersed. An effective installation of lighting in such a yard was recently made by the Pittsburgh & Lake Erie at McKees Rocks, Pa., just outside the city limits of Pittsburgh. This yard contains about twenty tracks extending for approximately one half mile.

The sources of light are eight Cooper Hewitt quartz lamps, mounted on steel towers, as shown in the accompanying illustration. The lamps are rated at 2,400 candle power, with an energy consumption of 726 watts, resulting in an efficiency of .3 watts per candle. Direct current at 220 volts is supplied to the lamps from the company's power plant located nearby.

The towers are 12 ft. square at the base, 100 ft. high, and are



General View of the P. & L. E. Yard at McKees Rocks Showing 100-ft. Steel Towers Supporting 2400 Candlepower Lamps

spaced about 400 ft. apart in two rows, one on each side of the yard, which is approximately 225 ft. wide. Each lamp is suspended from a short mast arm which extends out over a platform for the attendant, access to which is had by means of a ladder mounted on the side of the tower. A chain and a cut-out, however, permit the lamp to be lowered from the ground, thus obviating the necessity of the lamp attendant climbing the tower.

As the quartz burners have a life of several thousand hours, and the globes are at such a height as to be out of the smoke zone, almost no cleaning or other attention is required. The light given by these lamps enables the men to see with proper clearness, not only every track and car, but also the switches at the head of the yard. The illumination is such that one may readily read a newspaper at night. The absence of shadows and glare greatly facilitates the movement of the cars throughout the yard by permitting the exact location of each to be easily determined, and also tends to prevent accidents.

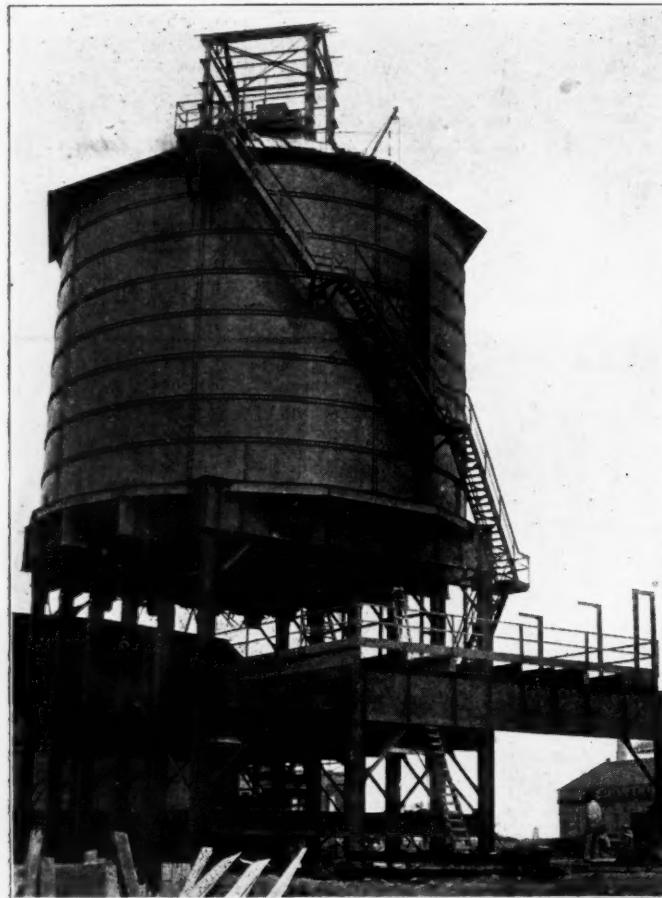
In addition to the increased speed in handling cars gained through the better lighting, conditions are made much easier

for the men returning on foot to the hump as they are enabled to avoid incoming cars, switches, posts and other obstacles. The fact that the lamps are mounted at such a height permits an excellent distribution of the light which possesses an inherent color value that is particularly suitable for outdoor illumination. Another feature that peculiarly adapts the quartz lamp to this field of lighting is the steadiness of the light.

This installation was made under the direction of D. P. Morrison, electrical engineer of the P. & L. E.

CONCRETE LINING FOR STEEL BUNKERS

The ability to place a coating of concrete over a steel surface with the cement gun has been utilized by the Minnesota Steel Company, Duluth, Minn., in lining a large circular steel tank used for supplying coal to its coke plant and also for lining a row of parabolic coal bunkers. This lining was adopted in connection with the steel tank as the best and most economical solution of the problem of storing coal containing small percentages of sulphur without damage to the tank from the corrosive action. Such a structure is said to be less expensive and lighter than one of reinforced concrete and the character of the material placed with the cement gun insures a continuous non-porous surface which it

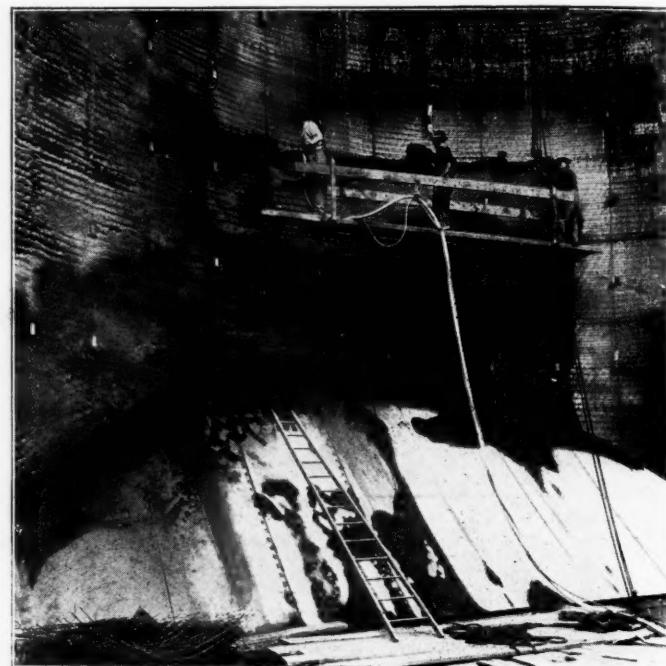


A 2,100-Ton Coal Bunker Lined With Concrete

is difficult, if not impossible, to secure by placing concrete by hand.

The circular tank is approximately 55 ft. in diameter and 40 ft. high, with a capacity of 2,100 tons of coal. The 33 parabolic bunkers are approximately 20 ft. wide, 12 ft. deep and 17 ft. long. A layer of 5 in. of concrete is used in the large tank and 2 in. in the bunkers. A layer of triangular mesh wire cloth was placed in horizontal bands over the inner surface of the tank, being secured to vertical rods attached to iron lugs provided at numerous places in the surface of the tank. The mesh was held away from the

steel approximately $\frac{3}{4}$ in. The first layer of "Gunite," which is the name applied to the material placed with the cement gun, was deposited through this mesh serving to hold the wire cloth in place and to cover and protect the steel plate thoroughly. A second layer of Gunite was then placed to bring the total thickness to 5 in. In the case of the parabolic bins, where the drop of the



Placing a Concrete Lining in a Large Coal Bunker With the Cement Gun

coal against the sides and bottom could never be great, a 2-in. lining was considered sufficient.

The work of lining these tanks was carried out by The Gun-
Concrete Company, Chicago.

STRENGTHENING THE TRANSCONA ELEVATOR

The work of moving back into position the storage of bins of the Canadian Pacific elevator at Transcona, near Winnipeg, which settled to an angle of 27 deg. from the vertical on October 18, 1913. As described in the *Railway Age Gazette* of April 18, 1913, both the handling house and the storage bins were supported on a reinforced concrete mattress. The usual tests indicated sufficient strength in this type of construction to carry the load without the necessity of sinking piers to bed rock, and confidence in this plan was increased by the fact that other elevators in this vicinity have been erected in the same way without mishap.

When the settlement of the bins occurred, the low corner of the foundation mattress settled to a point very much below the mattress of the handling house, but fortunately the latter structure was not disturbed sufficiently to cause any movement in it. Before the work of underpinning and straightening the bins could be undertaken, however, it was necessary to secure the handling house. This was accomplished by first sinking shoring piers to rock outside the main structure, on which timber shores were placed which were calculated to carry a very large proportion of the total weight of the building. The underpinning of the columns of the handling house was then undertaken by cutting through the mattress in the panels between columns and drifting in to points under the centers of the columns and there sinking piers to rock by the "Chicago" method.

After this underpinning of the handling house structure had been advanced sufficiently to make its stability absolutely certain, work was begun on the straightening of the bins. The bin

structure weighs about 20,000 tons, consisting of five rows of circular bins with 13 in each row. The final underpinning consists of five rows of piers with 14 in each row located under the contacts of the bins. Before any movement was allowed to take place, piers were sunk underneath the low corner of the mattress to avoid any possibility of the structure sinking further into the ground. On the high side a general excavation was made to a point about 15 ft. below the high corner of the mattress for the full length of the building. By the use of a belt conveyor placed along this excavation which delivered into the elevator at the north end, the excavated material was removed at a minimum cost.

After the low corner was made secure, work was undertaken on the other foundation piers, at the same time loosening up the supporting ground under the high side of the structure and allowing it gradually to sink back towards a plumb position. This method was followed until the structure reached an angle of 18 deg. from the vertical, when a series of solid oak rockers was introduced in the mattress on top of the middle line of piers. Jacks or shoring screws were placed underneath the low side, working on top of the piers that were in place, and by jacking up the low side and removing earth from under the high side the structure was gradually brought back until it was 8 deg. from the vertical when another line of oak rockers was introduced on the next line of piers east of the middle. This was done in order to give the structure an additional lift, which when it was brought into the vertical position, would leave the bottom of the tunnels above the natural ground water level.

During the settlement of the elevator the north end dropped about 5 ft. lower than the south end on account of the ground being somewhat softer at the north end and the supporting ground at the south end being prevented from flowing, due to the location of the work house. This inclination has been allowed to remain in straightening the elevator, as there is no loss of efficiency, convenience of operation or safety. The structure has been lifted above 12 ft. during the process of straightening, this movement being accomplished without any damage to the structure. The method adopted for straightening the elevator has proved efficient and very economical as compared with the cost of taking down the old structure and rebuilding it. This work was handled by The Foundation Company, New York, in conjunction with the engineering officers of the Canadian Pacific, lines west.

EDUCATIONAL WORK AMONG EMPLOYEES IN THE MAINTENANCE OF WAY DEPARTMENT

By J. T. BOWSER

Maintenance of Way Department, Queen & Crescent Route, Danville, Ky.

The value of educational work among railroad employees has long been recognized. In the mechanical and transportation departments there are apprentice schools, reading room courses of various kinds, and lectures on safety and efficiency. In the maintenance of way department very little has been done along this line, due perhaps to the fact that the employees of this department are so widely scattered. That much good can be done in an educational way among this class of railroad employees can hardly be questioned, but the methods employed in these other departments are not altogether practicable in the maintenance of way department, while their cost would probably be prohibitive.

I will set forth a few ideas which if carried out will be both practicable and inexpensive. Of course, anything of this nature must be entirely elective, and it will be said that the average section, extra gang, or bridge and building foreman has hardly enough time to do what is required of him, much less to give much attention to something that is entirely aside from his work. But the average foreman does read a little, and, by giving him something to read which will be of value to him, an interest may possibly be stimulated which will awaken an intelligence

which has become dormant in the rut of the routine of daily work.

The division head of the maintenance of way department on any railroad, with the co-operation of an intelligent and interested chief clerk, can organize an inexpensive system of educational work which will be of value to his subordinates. In the average division office two or three railroad or technical magazines may be found which, when read by the subscriber, are usually discarded or left on file for possible reference. Frequently one section of these magazines is devoted to the maintenance of way department and questions are discussed in such a manner that they may be readily grasped and understood by anyone interested in this class of work. These magazines can be forwarded to the foreman at one end of the road, with instructions attached to forward to the foreman next to him on the line when he has finished reading it, and so on over the entire road. These instructions can be gotten out by mimeograph and so worded as to apply to any literature which may be sent out. Copies of speeches, lectures, and even advertising matter, having more or less to do with railroading, which are constantly being received in the division offices, have their educational value and may be sent out in this manner. Articles of especial interest should be marked so as to be readily located.

Some discretion must, of course, be used in selecting the class of employees to whom a certain magazine or other piece of literature is to be sent. Literature having more strictly to do with bridges, buildings or concrete work should be sent to bridge and building foremen, though, when the interest of a section or extra gang foreman is really aroused, he will be interested in this also. Many will say that not one foreman in twenty will read this material, or if they read it, they will receive no practical benefit from it. What if only one in twenty does read what is sent him? It has made one better employee and has lost nothing.

It may not require much mental ability to tamp a tie or to frame a bridge timber, but if we are to supply the crying need for intelligent and resourceful foremen and supervisors, we must add a little variety to the mental food of those from whom we draw this supply. Give the track foreman something beside track and the bridge and building foreman something beside structures. The employees should be encouraged to ask questions personally or by mail, and if the office or the head of the department cannot answer all of them, a little effort on their part will secure the desired information and both parties will be benefited. Inquiries should be answered promptly so as not to discourage the questioner. All questions should be treated seriously, for an inquiring mind is often very sensitive to the least suggestion of ridicule. If, in the opinion of the head of the department, an inquiry can be better explained or answered by personal interview, the questioner should be summoned to the office and the matter thrashed over thoroughly. This personal attention will encourage him and many questions which might never have come up in correspondence may be discussed in a few minutes. Foremen should be encouraged to make trips over the road and see what others are doing, and especially to look over any interesting or unusual work which may be going on, and, briefly, a policy of interest and encouragement should be adopted to supply the food to keep the interest alive. Like any other innovation, it will have its scoffers, but the spirit is contagious, and results that are well worth the trouble and the slight expense will be obtained. Such a policy will create among the employees an increased respect for themselves and for their position. It will stimulate ambition, increase mental ability and vastly improve the quality of the material from which supervisors or other minor maintenance of way officers must be selected.

HOSTILE AIRCRAFT AND ENGLISH RAILWAY TRAINS.—The following notice has been posted in the London & South-Western trains: "In view of possible attacks by hostile aircraft it is necessary that the blinds in the carriages of all railway trains should be kept down after daylight. Passengers are requested to assist in this direction."

Boring 100,000 Ties by Hand With Simple Apparatus

A Description of the Manner in Which This Was Accomplished in a Short Time Without Special Equipment

By C. W. LANE

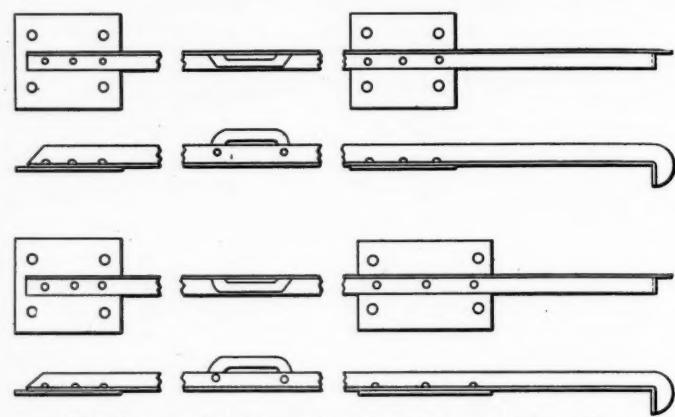
Supervisor, Timber Treating Plant, Baltimore & Ohio, Green Spring, W. Va.

The Baltimore & Ohio desired quick action in securing 100,000 treated ties, adzed and bored, for use with screw spikes on a special form of tie plate. A costly betterment of road was nearly one-half completed when the decision was made to use ties of this character, consequently no delay in furnishing the material could be permitted.

Of course, bored ties must be bored before treatment, and as the road operates a treating plant at Green Spring, W. Va., it was decided to adze and bore the ties at this plant. The road owned no boring and adzing machine, yet the cost of the work had to be kept down. It was plain that adzing the ties would be the most expensive part of the process and it was decided to eliminate this feature entirely by using only sawed ties, of which an adequate supply fortunately was available.

Plenty of air pressure at 100 lb. per sq. in. was to be had at the plant and it was determined to bore the ties by using small portable air motors capable of driving a $\frac{5}{8}$ -in. bit 6 in. into the wood. In one portion of the tie plant yard a standard gage track was paralleled by a narrow gage track 40 ft. away. It seemed logical, then, to load the sawed ties on

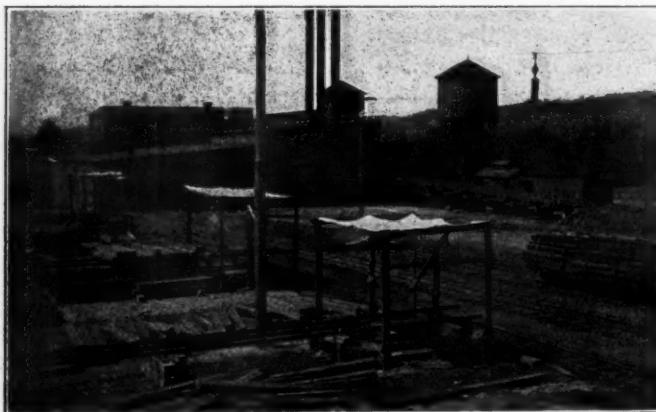
level crib-work of ties and a boring platform erected at the narrow gage end at the level of arms on the narrow gage tram cars, as before. This is the middle skidway shown in the illustration. This proved a fairly cheap construction, but for the third and last skidway built three 67-lb. rails were used at the height of a flat car floor and the arms on the trams, the rails being supported by simple crib-work of ties, as shown in the foreground of the illustration. It is well to



The Templet Used in Boring Intermediate and Joint Ties

note here that the first or sloping skidway proved to be the more efficient inasmuch as ties could be fed faster to the men doing the boring, which meant, of course, that the work could be done a little cheaper.

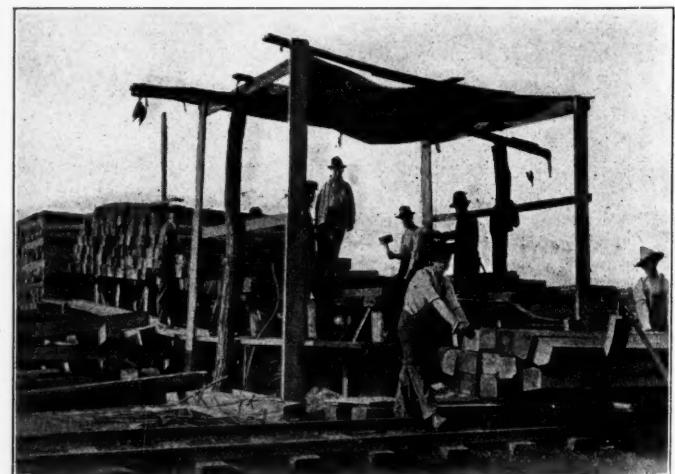
The sawed ties having been picked up in the yard, loaded on flat cars and delivered on the skidway, the next step was the marking of the places where the holes were to be bored.



The Three Skidways on Which the Ties to Be Bored Were Handled

flat cars in the yard, deliver them at one end of a rude skidway built between the standard and narrow gage tracks, bore them on a rough platform at the narrow gage end of the skidway, and load them on trams to be run into the cylinders for treatment.

In all such enterprises the adjusting of the little details of arrangement and apparatus means the ultimate success or failure of the project, so as a first step some little thought was given to the form of skidway upon which the ties were to be handled. The first skidway built was in the form of a rude trestle work, sloping from a height of about $2\frac{1}{2}$ ft. above the floor of a standard gage flat car to the level of the boring platform which was at the height of the arms on the narrow gage tram cars. This skidway is shown at the left in one of the accompanying illustrations. After this skidway was completed the cost of labor and material entering into its construction was deemed too high and a cheaper method of building these skidways was sought. There were some piles of ties ready for treatment between the narrow and standard gage tracks at this place and in building the next skidway one of these piles was taken down to a level slightly below that of a flat car floor. Rails were then laid across this



A Close View of One of the Skidways Showing the Inspection, Marking, Boring and Loading of Ties

This was done by using a template made of iron with holes exactly corresponding to the holes in the tie plate that was to be used. There were two of these templates, one for joint and one for intermediate ties, constructed according to the accompanying sketch. The joint ties had to have four holes bored for each tie plate, while the intermediate ties had to have only two holes for each plate. The little hook

on one end of the template was hooked over one end of the tie and thus determined the distance from the end that the holes were to be bored; this was known as the "line end" of the tie.

Two men performed the operation of marking the ties for boring. The template was first properly placed in position and then the men marked the places by driving a hand punch through the holes in the template with a wooden mallet. One little detail was quickly worked out which added greatly to the success of this part of the work. The punches were first made fast to a stiff spring which was in turn fastened to the template and which kept the punches out of the holes until struck. Instead of having to pick up and insert the marking punch in two or four holes and strike two or four blows with the mallet, according to the template used, one smart blow on the spring marked the whole set of holes. This little change naturally pleased the laborers and meant more output, which is only another way of saying "more money for the men at a cheaper rate for the company."

The ties having been marked were pushed along the skidway to the men who did the boring. The little air motors, driving the boring-bits, were suspended from a sort of walking-beam or old fashioned well-sweep, pivoted overhead so that it could move up or down, or in a horizontal direction, as desired. As the motors were too heavy to handle steadily all day they were counterbalanced by weights placed on these walking-beams. The bits with which the boring was done were fitted with stops to insure the holes being bored to the exact depth desired, which in this case was 6 in.

After the ties were bored they were immediately loaded on trams, stamped, checked, reported and sent to the treating cylinders.

In any statement of costs the particular conditions surrounding each bit of work bear directly on the unit-price, and the following prices are given as fairly well suited to the locality where this work was done, but with a full understanding that cheaper or possibly higher rates might fit the situation in other places. It cost 1½ cents per tie to sort out and load ties in the yard and ½ cent per tie to deliver them properly piled on the skidway.

A gang could bore 600 intermediate ties in 10 hours. The two men marking and pushing ties to the boring-platform and the two men doing the boring received 1½ cents per tie divided equally. These four men earned then about \$2.25 per 10-hour day per man. The two men loading trams received ¾ cent per tie or \$2.25 each for 600 ties. This made the total cost for an intermediate tie 4½ cents.

A gang could bore 400 joint ties in 10 hours. The rate for marking and boring these ties was 2¼ cents per tie, but the men loading the trams received the same rate of ¾ cent per tie because they could be loading other trams at regular yard rates during the time they had to wait for the slower moving joint ties to be bored. The total cost per joint tie was therefore 5 cents. A portion of these costs should not be included in the bill against adzing and boring by hand, because these same ties would, in the natural course of events, have to be picked up for treatment which would cost something, varying at the different plants, say, approximately 1½ cents per tie. This leaves then as the cost chargeable strictly to this work 2¾ cents for the intermediate ties and 3½ cents for the joint ties, which is entirely prohibitive as compared with work done by a modern adzing and boring machine, but is not necessarily prohibitive when a comparatively small number of ties are needed, as in this instance, to form a component part of a costly project.

The initial cost of an adzing and boring machine properly installed, of a sufficient size to take care of the requirements of a fair sized road, would probably be \$15,000 to \$18,000, including, of course, the buildings and grading necessary. In this instance, the installation of such a machine could not be considered inasmuch as speed and immediate delivery of the output were vital.

DIFFICULT TRACK MAINTENANCE

The track maintenance in the New York subway is of interest to maintenance men because of the very dense traffic on these tracks which, among other things, gives a very short interval of time between trains in which the men can work. Regardless of these frequent interruptions, the tracks must be in condition for the passage of trains whenever necessary. The question of safe-guarding the men at work in so limited a space, either from coming in contact with each other or from an oncoming train, and yet to work them to the best advantage, is a difficult one in itself. Some very interesting points in this connection were brought out in a paper read by O. O. Dixon, assistant engineer, Interborough Rapid Transit Company, before the New York Railroad Club on October 16, 1914. The following abstracts are taken from the paper:

When relaying rails under traffic, a gang consists of about 18 to 20 men. The work involves the withdrawing of the spikes, taking off the joints, cutting out the bonds, the removal and replacement of rails and rebonding. One rail is removed in from one to two minutes. From 1:00 a. m. until 5:00 a. m. 33 rails can be renewed on curves of local tracks. The intervals between trains on local tracks during these hours is 7½ minutes. On the express tracks, where there is no traffic during the hours mentioned, 65 rails can be renewed on curves, and more on tangents.

The men are protected by two caution lights placed 500 ft. away from the gang, and a man with a red light within communicating distance of the gang. In pulling the spikes between the third rail and the running rail a shank bar is used. The ballast in front of express stations is taken out and renewed about every two years, and at local stations every five years. Few ties have been renewed, except at switches and on curves where they have split due to frequent rail renewals, also where they were decayed due to dry rot. In making tie renewals, one rail is removed and all new ties installed for a rail length.

In the initial installation 100 lb., 33-ft. rails were used with joints staggered and spliced with 24-in., four-bolt angle bars. On curves the same construction was used, with the addition of an inclined guard rail which was bolted to the lower rail about every three feet, using adjustable cast iron separators to take up the wear. The curves were laid to 4 ft. 8½ in. gage, and the flangeways varied from 1¾ in. to 2¼ in., depending upon the degree of curvature. It was soon found that the guard rail was so flexible that it concentrated the pressure on the bolts, causing frequent breakages, and when the bolts held the wheels were allowed to sideslip between them, causing considerable corrugation. In view of these facts this light guard rail was replaced by one of the same section as the running rail, having one flange sheared off. The adjustable separators were replaced by one-piece separators to give the correct flangeway, also the gage of track was slightly widened on sharp curves, depending on the radius. Later, the rails on the high side of a curve having a radius of 700 ft. or less, were further reinforced with malleable iron tie plate rail braces placed on every other tie, also shoulder tie plates and cast iron rail braces were installed to support the guard rail and relieve the strain on the guard rail bolts. Under existing conditions of traffic it is necessary to use as many as four anti-creepers per rail to prevent the traveling of the rails. Owing to the frequent rail renewals, screw spikes have not been used to any extent because of the time and difficulty involved in pulling them.

DAMAGE TO THE OTTOMAN RAILWAY OF ASIA MINOR.—The secretary of the Ottoman Railway from Smyrna to Aidin has announced that a severe earthquake occurred in the Sparta and Bouldour district of Asia Minor on October 4, and damaged the roadbed in several places, although operation was resumed in less than 24 hours. Two stations and other buildings have been seriously damaged, but it is estimated that the total cost of repairs will not exceed \$45,000.

General News Department

In a fire at Galveston, Tex., November 17, the Southern Pacific elevator was destroyed, together with 909,000 bushels of wheat; loss \$1,500,000.

E. L. Tinker, secretary of the Central Safety Committee of the El Paso & Southwestern, has resigned that position and the duties have been taken up by R. P. Kyle. Headquarters at El Paso, Tex.

It was announced in Canada, November 13, that regular trains would begin running on the National Transcontinental Railway between Moncton and Levis this week. A train will run each way three times a week.

The Atchison, Topeka & Santa Fe, on November 10, had the largest commercial freight loading in its history. A total of 5,229 cars were loaded on the entire system that day, compared with the previous record of 5,204.

The St. Louis & San Francisco has announced that on November 10 train auditors were removed from all passenger trains on the system, and their duties are now performed by the conductors. The order is said to be a part of the company's general retrenchment policy.

The New York State Civil Service Commission announces examinations to be held December 12 for the position of inspector of equipment, for the Public Service Commission, First district (New York City). The salary will be from \$900 to \$1,200 yearly. The commission desires to get men who have had six years' experience in car house or car shop work.

Fairfax Harrison, president of the Southern Railway, speaking at Atlanta, last week, said that the severe retrenchment made necessary by the falling off in traffic would be continued, even to the extent of depriving passengers of some of the luxuries and conveniences which they have been accustomed to. The gross receipts of the railway company in September were 8.33 per cent less than in the same month of last year, and in October the decrease was 18.75 per cent. Curtailment of expenses has been necessary, in some cases, as a "war measure," even where it was uneconomical to make the reduction. Both the officers and the employees of the company have to stand serious losses. He believes that the present severe stress will be temporary and new construction work, provided for by capital which was raised last spring, has not been suspended.

Complete official figures show that the majority given by the voters of Missouri against the full crew bill was three times as great as was shown in the estimate based on the early returns; 324,085 votes against and 159,593 in favor, a majority of 164,492 in opposition to the bill. This makes the vote more than two to one against the law. Outside of the three principal cities, St. Louis, Kansas City and St. Joseph, the measure received only 86,660 votes in the state, and was beaten by a ratio of about three to one. The farmers in every section of the state voted almost solidly against it. St. Louis, in which the Brotherhood looked for a big majority in favor of the bill, went against it by 18,417. In Kansas City and in St. Joseph it was carried. The majority against the bill is one of the greatest in the history of Missouri and is larger than the state has ever given to any candidate.

Increased Passenger Fares in Eastern Territory

The Pennsylvania and the Philadelphia & Reading have filed with the Interstate Commerce Commission new passenger tariffs, to go into effect December 15, which advance the rates for many long distance interline tickets and abolish round trip tickets for local travel. Despatches from Washington indicate that changes, like these, and others of smaller amount, are to be made by all the principal roads in trunk line territory. Most of the interline rates in the new tariff are made on the basis of 2½ cents a mile. From Philadelphia to Chicago the present rate is \$18.22; new rate \$19.10; Philadelphia to Indianapolis, present rate \$16.72, new rate \$18.03. Local round trip tickets will cost double the

one way fare. Examples of this change are: from Philadelphia to Paoli and return, present rate 80 cents, new rate \$1; Atlantic City, by electric line \$1.75, advanced to \$2; by steam line \$2 to \$2.25. The round trip rate between New York and Philadelphia, \$4, will be advanced to \$4.50; between Baltimore and Washington \$4, advanced to \$4.80; Philadelphia and Washington \$6, advanced to \$6.80. On the Reading the round trip rate between the terminus and Wayne junction is advanced from 20 cents to 26 cents. Monthly tickets on both roads will be advanced 25 cents a month. Tickets good for 100 rides (family tickets) will be withdrawn from sale, as will also the fifty-trip tickets. Ten-ride tickets good for bearer will be sold at nine-tenths the local rate for ten single tickets.

Tramps by the Train Load

A press despatch from San Bernardino, Cal., November 16, says that 93 tramps, on their annual winter tour westward, are in jail at that place, charged with having seized a San Pedro, Los Angeles & Salt Lake freight train on the Mojave desert. The tramps, more than a hundred strong, when the train entered Otis overpowered the trainmen, broke seals of freight cars and after making themselves comfortable, ordered the engineman to proceed to Los Angeles. A posse was waiting at San Bernardino for the train, and all but ten of the tramps were captured.

Arbitrators in Western Enginemen's and Firemen's Controversy

The arbitration board, to consider enginemen's and firemen's wages on the western roads, has finally been completed, after months of delay, and hearings are to be begun at Chicago, November 30. The arbitrators are: H. E. Byram, vice-president of the Chicago, Burlington & Quincy; W. L. Park, vice-president of the Illinois Central; F. A. Burgess, assistant grand chief of the Brotherhood of Locomotive Engineers; Timothy Shea, assistant to the president of the Brotherhood of Locomotive Firemen and Enginemen; Charles Nagel, ex-secretary of Commerce and Labor, and Jeter C. Pritchard, presiding judge of the United States Court of Appeals of the Fourth Circuit.

Electrification on the St. Paul

Construction work in connection with the electrification of the Chicago, Milwaukee & St. Paul between Harlowton, Mont., and Avery, Idaho, has been resumed. Thus far the poles have been placed for a distance of 30 miles on the 116-mile division between Three Forks and Deer Lodge, Mont., which is the first to be equipped. The company has ordered nine freight and three passenger electric locomotives from the General Electric Company. These locomotives will be of the same construction except that those to be used for passenger service will be geared for a higher speed. The total weight of these locomotives will be 519,000 lb. each, and the weight on drivers 400,000 lb. They are to be delivered in October, 1915, at which time, it is planned, the construction work over the entire line will have been completed.

Railway Development Association

At the closing session of the Railway Development Association held in Chicago last week, a report of which was given in last week's issue, Mrs. Edith Loring Fullerton, wife of H. B. Fullerton, director of agricultural development of the Long Island Railroad, was elected an active member of the association. Mrs. Fullerton has actively co-operated with her husband in the direction of the Long Island experimental farm at Medford, L. I., since its establishment in 1905, and has recently been appointed assistant director of agricultural development. She was the author of a book, "The Lure of the Land," describing the Long Island development work, which was widely circulated, and is vice-president of the Woman's Agricultural and Horticultural

Association. It was decided to hold the annual meeting of the association on May 10, 11 and 12, 1915, at St. Paul, Minn.

Western Association of Short Line Railroads

Thirty representatives of the short line railroads in California, Arizona, Nevada and Idaho met in San Francisco, November 17, and formed a permanent organization to look after their common interests as to rates for carrying the mails, legislative matters and dealing with the Interstate Commerce Commission. The organization will be known as the Western Association of Short-Line Railroads. D. M. Swobe, vice-president of the McCloud River Railroad, San Francisco, was elected president.

A committee was instructed to oppose the Bourne and Moon bills pending in Congress, in both of which the provisions are such that, it is believed, the payments to the small roads for carrying the mails will be reduced.

Revenue and Expenses of Steam Roads in August

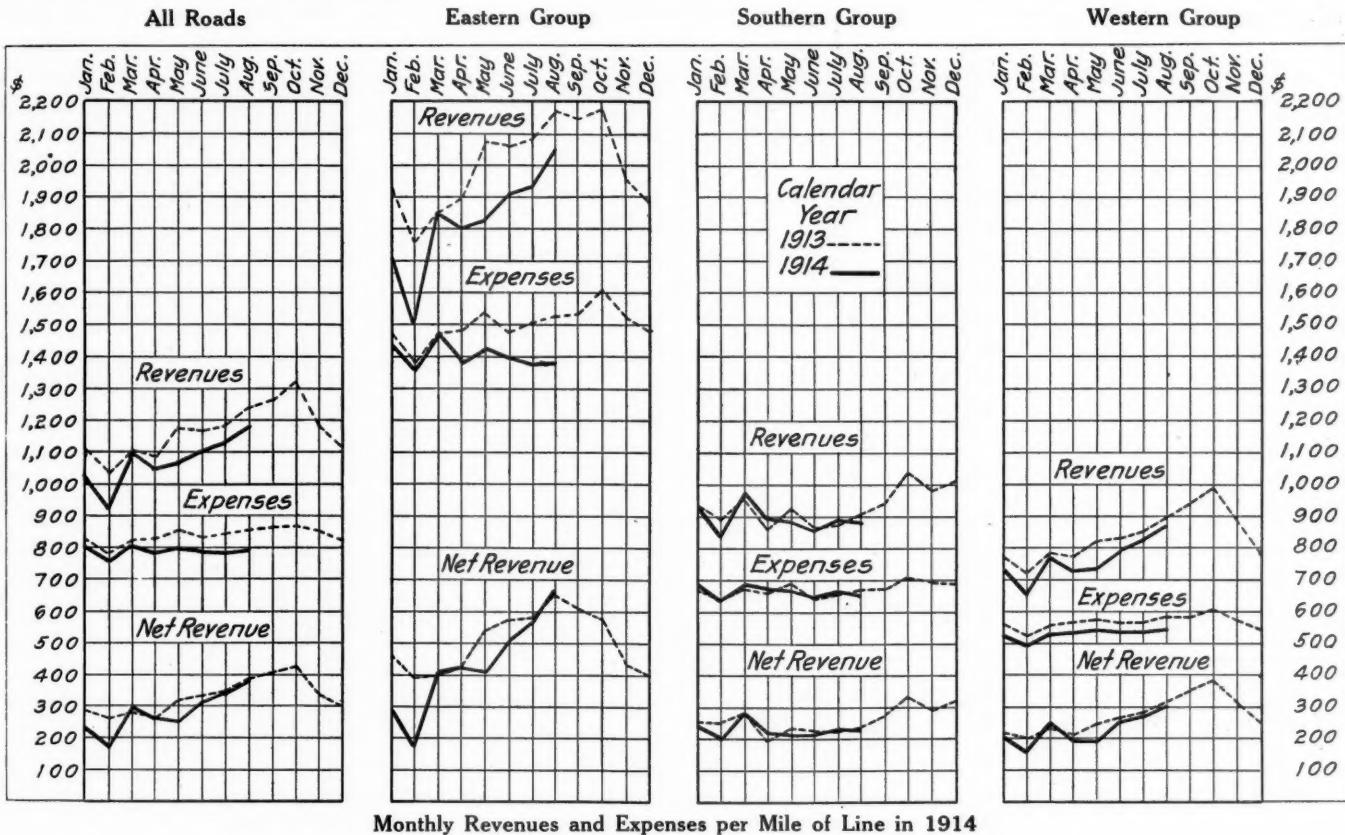
The Bureau of Railway Economics' summary of revenues and expenses and comments thereon for August, 1914, are as follows: Railways operating 227,184 miles of line are covered by this summary, or about 90 per cent of all steam railway mileage in the United States. Their operating revenues for the month of August, 1914, amounted to \$266,928,165. This amount

the fact that net operating revenue per mile decreased. Net operating revenue per mile of line averaged \$386 in August, 1914, and \$388 in August, 1913, a decrease of \$2 per mile, or 0.6 per cent.

Taxes for the month of August amounted to \$11,288,351, or \$50 per mile, an increase of 0.7 per cent over August, 1913.

Operating income, which is net revenue from rail and auxiliary operations, less taxes, averaged \$336 per mile of line, and in August, 1913, \$339, thus decreasing \$3 or 0.8 per cent. Operating income for each mile of line for each day in August averaged \$10.85, and in August, 1913, \$10.95. Operating income is that proportion of their operating receipts which remains available to the railways for rentals, interest on bonds, appropriations for betterments, improvements, new construction, and for dividends.

The railways of the Eastern district show a decrease in total operating revenues per mile of line as compared with August, 1913, of 6.4 per cent, the railways of the Southern district a decrease of 2.3 per cent, and the railways of the Western district a decrease of 5.1 per cent. Operating expenses per mile decreased 10.0 per cent in the East, decreased 2.3 per cent in the South, and decreased 6.7 per cent in the West. Net operating revenue per mile increased 2.0 per cent in the East, decreased 2.3 per cent in the South, and decreased 2.2 per cent in the West. Taxes per mile show an increase of 1.0 per cent in the East, an increase of 2.1 per cent in the South, and an increase of



Monthly Revenues and Expenses per Mile of Line in 1914

includes revenues from freight and passenger traffic, from carrying mail and express, and from miscellaneous sources connected with rail and auxiliary operations. Compared with August, 1913, these operating revenues show a decrease of \$12,496,358. Total operating revenues per mile averaged \$1,175 in August, 1914, and \$1,244 in August, 1913, a decrease of \$69, or 5.6 per cent.

Operating expenses, which include the cost of maintaining track and equipment, operating trains, securing traffic, and of administration, amounted to \$179,163,880. This was \$12,989,650 less than for August, 1913. These operating expenses per mile of line averaged \$789 in August, 1914, and \$856 in August, 1913, a decrease of \$67 per mile, or 7.8 per cent.

Net operating revenue, that is, total operating revenues of rail and auxiliary operations less operating expenses, amounted to \$87,764,285, which was \$493,292 more than for August, 1913, but that this increase is due to increase in mileage is shown by

0.5 per cent in the West. Operating income per mile increased 2.1 per cent in the East, decreased 3.1 per cent in the South, and decreased 2.7 per cent in the West.

The operating ratio for August, that is, the per cent of total operating revenues absorbed in operating expenses, was 67.1 per cent, which is comparable with 68.2 per cent in August, 1913, and 64.0 per cent in August, 1912. The operating ratio in the Eastern district for August was 67.3 per cent, as compared with 70.0 per cent for August, 1913; was 74.2 per cent in the Southern district as compared with 74.2 per cent in 1913; was 64.5 per cent in the Western district, as compared with 65.5 per cent in 1913.

Comparison of returns for two months of the current fiscal year with those of the corresponding months of the previous fiscal year reveals a decrease in total operating revenues per mile of 5.3 per cent, a decrease in operating expenses per mile of 7.0 per cent, and a decrease in net operating revenue per mile

of 1.3 per cent. This net operating revenue per mile decreased 0.3 per cent in the East as compared with the corresponding period of the previous year, decreased 0.5 per cent in the South, and decreased 1.9 per cent in the West.

When the returns for the eight months of the calendar year 1914 are compared with those of the corresponding months of 1913, they show a decrease in total operating revenue per mile of 6.2 per cent, a decrease in operating expenses per mile of 4.8 per cent, and a decrease in net operating revenue per mile of 9.8 per cent. This net operating revenue per mile decreased 15.0 per cent in the East as compared with the corresponding period of the previous year, decreased 3.6 per cent in the South, and decreased 6.6 per cent, in the West.

The diagram shows the variations in operating revenues, operating expenses, and net operating revenue per mile for the separate months of the calendar year 1913 and of the calendar year 1914 to date, and the following table shows the per cent of operating revenues consumed by each class of expenses:

Account	August, 1914				Two months of the fiscal year 1915
	United States	Eastern District	Southern District	Western District	
Freight revenue	66.3	65.1	69.5	66.4	66.0
Passenger revenue	25.0	25.4	23.4	25.1	25.1
Mail revenue	1.7	1.4	1.7	2.1	1.8
Express revenue	2.1	2.1	2.3	2.1	2.2
All other revenues.....	4.9	6.0	3.1	4.3	4.9
Maintenance of way and structures	13.2	12.1	14.7	13.9	13.4
Maintenance of equipment.	16.5	16.8	20.3	14.9	16.9
Traffic expenses	1.8	1.5	2.5	2.0	1.9
Transportation expenses ..	32.8	34.0	34.1	30.9	33.3
General expenses	2.2	2.1	2.5	2.3	2.3
All other expenses	0.6	0.8	0.1	0.5	0.6
Total operating expenses	67.1	67.3	74.2	64.5	68.4

International Engineering Congress

Announcement has been made of the program for the International Engineering Congress to be held in San Francisco, September 20 to 25, 1915, under the auspices of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Society of Naval Architects and Marine Engineers. Col. G. W. Goethals, governor of the Canal Zone, has consented to act as honorary president of the congress and is expected to preside over its general sessions. In spite of the conditions now prevailing in Europe the committee of management is in receipt of a sufficient number of communications from various foreign countries to indicate that a large majority of the papers originally requested for presentation at the sessions of the congress will be handed in on time and that the congress will be truly international in character. The total number of papers contemplated was about 290. Of this number about 220 are either definitely promised or well assured. The remainder, apportioned chiefly among the nations in the present war zone, are uncertain and it is expected that some of them will not be secured, but it is believed that by substituting for these others that have been offered the general plan for the congress may be carried out with a minimum of change.

The papers to be presented will cover the general field of engineering in a broad and comprehensive manner and with special reference to the important lines of progress during the past decade, and the most improved practices of present and future development. The authors of the papers are distributed over the engineering world and comprise men eminent in the various branches of the profession. A special effort will be made to procure discussions carefully prepared in advance for presentation with the papers, and opportunity will be afforded for oral discussion. The meetings will be held in the new Auditorium building in the civic center of San Francisco. The topics to be discussed are grouped as follows: Panama Canal, 24 topics; waterways, 6 topics; irrigation, 11 topics; railways, 7 topics; municipal engineering, 8 topics; materials of engineering construction, 20 topics; mechanical engineering, 28 topics; electrical engineering, 8 topics; mining engineering, 10 topics; metallurgy, 10 topics; naval architecture and marine engineering, 19 topics, and miscellaneous. The topics to be discussed in relation to railways include: Relation of railways to social development; present status of railways; economic factors govern-

ing building of new lines and location; physical characteristics of road, including track and roadbed; bridges, tunnels and terminals; construction methods; signals; equipment, including motive power other than electric; rolling stock in general; loading equipment and electric motive power in general.

B. F. Yoakum Suggests Government Copartnership in Railways

B. F. Yoakum has addressed a letter to Judson C. Clements of the Interstate Commerce Commission, to clear up a misunderstanding which he says has arisen from his testimony before the Interstate Commerce Commission in the Rock Island investigation, and to show that he is in favor of a form of government co-partnership, as distinguished from government ownership. Mr. Yoakum says that he believes a co-partnership arrangement under special federal charters to be granted to railroads desirous of operating under a federal license would be the wisest solution of the present unsettled condition. "The federal government," he said, "is now regulating the expenses and revenues of railroads, but should go a step further and safely aid them in future financing, and in consideration therefor enjoy a share of the profits, with representation on the boards of directors." His plan contemplates an exchange of government 3 per cent bonds for the higher interest railroad bonds.

"The change of securities," he says, "should be gradual through the creation of a low interest bearing government-railroad bond to take the place of the underlying higher interest bearing railroad bonds as they may mature; or they could be exchanged under a refunding process. Each transaction should be approved by the Interstate Commerce Commission, always provided that the net earnings of the railroad must be at least 2½ times the interest on the government-railroad bonds exchanged for the present underlying bonds. These new bonds should be a first lien on the property. All junior mortgage bonds and the stock would be subject to these new bonds, on which the government would not be responsible but would, under equitable terms to be agreed upon, share in the profits with the stockholders. At a rough estimate, in the course of a few years, one-half of the present underlying bonds, or about five billion dollars, would be exchanged or refunded into a lower interest bond. A large proportion of these old bonds bear 5 per cent and 6 per cent, and a few 7 per cent interest; therefore under the proposed system there would eventually be a saving to the railroads of approximately 100 million dollars a year in interest alone. This is on the assumption that such a government-railroad bond, being a first lien, would be as attractive to bankers and investors as the present 3 per cent government Panama canal bonds. If in this way the railroads of the country can save 100 million dollars a year in the item of interest, under my estimate it would insure the government receiving as its share under the proposed co-partnership arrangement, probably from 15 to 20 million dollars a year."

The Railway Business Association

Fairfax Harrison, president of the Southern Railway, and Warren G. Harding, United States senator-elect from Ohio, are announced as the speakers for the sixth annual dinner of the Railway Business Association, the national organization of manufacturers, merchants and engineers dealing with steam railroads, which will be held at the Waldorf-Astoria hotel, New York, Thursday evening, December 10. The business meeting of the association will be held at 11 a.m. at the hotel, the election of officers at 1.30 p.m. and the dinner at 7, the doors opening exactly on the hour.

The circular announcing the names of the speakers says in part: "Mr. Harrison unites long experience and responsibility as a railway official with the oratorical art of the attorney. Practiced for many years in the study of public opinion as it affects the prosperity of the railways, he is a leader in the cultivation of friendly sentiment and cordial co-operation between railway managers and the people whom they serve."

"Mr. Harding is a journalist with substantial business interests. During several years of legislation affecting business and transportation he has given constant admonition, caution and counsel lest industry and commerce be shackled and the public welfare impaired. On that platform he has now been chosen by the people of Ohio as their senator in Congress. The obligation of government to promote national prosperity will furnish the keynote of his

address, while his brilliant endowment as a writer and speaker complete the promise of a message appetizing in form as well as invigorating in substance.

"Subscribers to the dinner as this circular goes to press exceed those upon the corresponding date in 1913. Such response to an announcement not naming the speakers and at a time like the present is a display of enthusiasm by our members which proves anew their belief in the cause and their loyalty to the work."

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

- AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Next convention, May 4-7, 1915, Hotel Sherman, Chicago.
- AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Demurrage Commissioner, Boston, Mass. Annual convention, April, 1915, Richmond, Va.
- AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—H. C. Boardman, D. L. & W., Hoboken, N. J. Next meeting, October, 1915.
- AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, Illinois Central, East St. Louis, Ill. Annual meeting, May 21-24, 1915, Richmond, Va.
- AMERICAN ASSOCIATION OF PASSENGER TRAFFIC OFFICERS.—W. C. Hope, C. R. R. of N. J., 143 Liberty St., New York.
- AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, Room 101, Union Station, St. Louis, Mo. Next meeting, May 20-21, 1915, San Francisco, Cal.
- AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 20 W. 39th St., New York. Annual convention, October, 1915, San Francisco, Cal.
- AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOCIATION.—H. C. McConaughay, 165 Broadway, New York. Meetings with American Electric Railway Association.
- AMERICAN RAILROAD MASTER TINNERS, COPPERSMITHS AND PIPEFITTERS' ASSOCIATION.—W. E. Jones, C. & N. W., 3814 Fulton St., Chicago. Annual meeting, Chicago.
- AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next session, May 19, 1915, Atlantic City, N. J.
- AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 19-21, 1915, Detroit, Mich.
- AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 16-18, 1915, Chicago.
- AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Annual meeting, June 9-11, 1915, Atlantic City, N. J.
- AMERICAN RAILWAY SAFETY ASSOCIATION.—L. F. Shedd, C. R. I. & P., Chicago.
- AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Annual meeting, July, 1915.
- AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.
- AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. W. Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except June, July and August, 220 W. 57th St., New York.
- AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York. Regular meetings, 2d Thursday in month, at 2 P. M., 11 Broadway, New York.
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. Annual meeting, December 1-4, 1914, New York.
- AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 19-21, 1915, Chicago.
- ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, 1300 Pennsylvania Ave., N. W., Washington, D. C. Annual convention, April 28, 1915, Atlanta, Ga.
- ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.—George W. Lyndon, 1214 McCormick Bldg., Chicago.
- ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md. Annual meeting, third week in May, 1915, Galveston, Tex.
- ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreuccetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Annual meeting, October, 1915.
- ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Soo Line, 112 West Adams St., Chicago. Annual meeting, June 22-25, 1915, Rochester, N. Y.
- ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Next meeting, December 8-9, Richmond, Va.
- BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meetings with American Railway Bridge and Building Association.
- CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.
- CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.
- CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawler Ave., Chicago. Regular meetings, 2d Monday in month, except July and August, Lytton Bldg., Chicago.
- CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meetings, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.
- ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.
- FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, R. F. & P., Richmond, Va. Annual meeting, June 16, 1915, Chicago.
- GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.
- INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, Rue de Louvain, Brussels, Belgium. Next convention, June 23 to July 6, 1915, Berlin.
- INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, C. & E. I., 922 McCormick Bldg., Chicago. Annual meeting, May 17-20, 1915, Chicago.
- INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 W. Broadway, Winona, Minn. Next convention, July 14-17, 1915, Sherman House, Chicago.
- INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, C. H. & D., Lima, Ohio. Annual meeting, August 17, 1915, Philadelphia, Pa.
- MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo.
- MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 26 to 28, 1915, Chicago, Ill.
- MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 14-17, 1915, Detroit, Mich.
- MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Annual meeting, June 14-16, 1915, Atlantic City, N. J.
- NATIONAL RAILWAY APPLIANCES ASSOCIATION.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Next convention, March 15-19, 1915, Chicago.
- NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.
- NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.
- NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. Frankenberger, 623 Briskebane Bldg., Buffalo, N. Y. Meetings monthly.
- PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill. Regular meetings, 2d Thursday in month, Jefferson Hotel, Peoria.
- RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Friday in month, Kansas City.
- RAILROAD MASTER TINNERS, COPPERSMITHS AND PIPEFITTERS' ASSOCIATION.—U. G. Thompson, C. & E. I., Danville, Ill. Annual meeting, May, 1915.
- RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York. Annual meeting, December 10, 1914, Waldorf-Astoria Hotel, New York.
- RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.
- RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOCIATION.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Association of Railway Electrical Engineers.
- RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Fire Ins. Agt., Mobile & Ohio, Mobile, Ala. Next meeting, October, 1915.
- RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Times Bldg., Bethlehem, Pa. Next meeting, March 15, 1915, Chicago. Annual meeting, September 21-24, 1915, Salt Lake City, Utah.
- RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, L. S. & M. S., Box C, Collinwood, Ohio. Annual meeting, May 17-19, 1915, Hotel Sherman, Chicago.
- RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with Master Car Builders and Master Mechanics' Associations.
- RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 50 Church St., New York. Meetings with Association of Railway Telegraph Superintendents.
- RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.
- ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Annual meeting, September 14-16, 1915, Chicago.
- ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.
- SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, Hotel Utah Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.
- SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmunds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.
- SOCIETY OF RAILWAY FINANCIAL OFFICERS.—Carl Nyquist, C. R. I. & P., La Salle St. Sta., Chicago. Annual meeting, September, 1915.
- SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. R. R., Atlanta, Ga. Next regular meeting, January 21, 1915, Atlanta, Ga.
- SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Candler Bldg., Atlanta.
- TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boddy House, Toledo.
- TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.
- TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.
- TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings last Tuesday in month, except June, July and August, Waldorf-Astoria, New York.
- TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie R. R., Pittsburgh, Pa. Meetings bimonthly, Pittsburgh. Annual meeting, 2d Monday in June.
- TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.
- TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Annual meeting June 15, 1915, Minneapolis, Minn.
- TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, L. S. & M. S., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.
- TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, September, 1915, Chicago.
- WESTERN CANADA RAILWAY CLUB.—W. H. Roseyear, P. O. Box 1707, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.
- WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.
- WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings.

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF SEPTEMBER, 1914—CONTINUED

Name of road.	Average mileage operated during period.		Operating revenues		Maintenance of way and structures.		Operating expenses		Net operating revenue (or deficit).	Railway tax	Operating income (or loss).	Increase (or decrease) comp. with last year.		
	Freight.	Pasenger.	inc. misc.	structures.	equipment.	Traffic.	Transportation.	Miscellaneous.						
Chicago, Peoria & St. Louis.....	\$31,262	\$159,791	\$25,128	\$24,524	\$61,226	\$5,585	\$121,842	\$37,948	\$6,700	\$32,248	\$45,551	.....	
Delaware & Hudson Co.—R. R. Dept.	326,224	2,068,596	130,630	317,957	689,035	\$13,544	57,822	1,221,472	837,124	56,250	780,818	.....	
Kansas City, Mexico & Orient.....	29,324	192,243	29,445	20,399	8,279	69,222	8,259	131,604	56,639	8,900	48,139	-12,530		
Oahu Ry. and Land Co.—Terminal.....	60,866	22,927	9,735	10,896	646	21,298	3,964	46,540	43,426	7,250	36,176	39,259		
St. Louis Merchants' Bridge Terminal....	109	166,062	23,790	4,567	769	80,180	9,167	118,723	47,750	8,330	39,259	58,984		
St. Louis, San Francisco & Texas.....	244	55,420	29,242	15,080	2,200	45,175	4,666	93,080	19,146	2,327	161,888	-35,233		
St. Louis, Southwestern of Texas.....	943	440,682	107,496	585,805	75,954	97,006	26,037	164,212	28,125	2,926	161,888	-96,244		
St. Louis, Southwestern of Texas.....	811	184,390	84,055	295,357	75,731	74,702	12,464	137,025	9,945	2,301	15,500	-43,974		
San Antonio & Aransas Pass.....	724	284,891	105,678	417,263	56,166	73,072	17,207	10,112	38,387	98,876	12,000	86,740	-135,696	
San Pedro, Los Angeles & Salt Lake.....	1,132	133,984	785,956	189,967	189,967	189,967	31,076	246,417	13,383	40,012	218,965	584		
Seaboard	2,099	1,053,018	3,194,503	1,529,522	5,509,732	806,401	1,038,222	268,024	64,211	596,800	6,539	393,682	1,000	
Southern in Mississippi.....	2,036	5,693,763	2,398,900	9,040,322	791,586	1,169,185	151,006	2,669,639	147,787	229,038	5,136,185	3,905,287	-161,240	
Southern Pacific	6,522	1,281	5,1483	17,771	88,402	1,204,401	22,504	2,919,020	21,961	2,280	3,016	17,816	-7,353	
Spokane International	163	45,417	17,393	67,589	15,863	5,753	2,280	1,201,847	75,177	118,167	2,826,046	2,744,141	-30,396	
Spokane, Portland & Seattle.....	556	301,061	136,155	480,338	49,966	34,731	7,335	92,984	3,800	20,538	277,800	53,400	24,376	
Tennessee Central.....	294	84,673	37,088	130,051	32,519	18,508	5,816	52,638	.....	6,762	13,808	4,480	26,998
Terminal R. R. Ass'n of St. Louis.....	35	169	198,777	241,200	16,884	9,130	904	77,791	.....	1,059	12,268	9,017	30,406
Texas & New Orleans.....	469	198,219	313,054	67,169	116,478	7,397	129,852	16,854	11,391	34,900	1,055,287	15,723	10,915	
Texas & Pacific	1,887	950,726	363,169	1,443,307	145,336	239,533	34,280	582,887	15,931	38,980	1,055,287	37,020	115,248	
Toledo & Ohio Central.....	446	64,703	61,789	108,517	17,170	27,193	6,794	194,572	1,960	9,339	26,030	12,300	4,714	
Toledo, Peoria & Western.....	248	58,557	44,214	383,185	52,242	2,162	43,936	11,020	12,644	1,467	6,100	8,575	1,193	
Toledo, St. Louis & Western.....	451	326,799	28,714	147,979	61,247	22,848	8,417	140,442	.....	8,097	27,829	22,000	89,356
Trinity & Brazos Valley.....	315	39,521	147,979	61,247	22,848	8,417	140,442	.....	8,097	11,356	12,900	20,435	-30,550
Ulster & Delaware.....	129	48,261	34,794	98,109	19,117	14,119	1,430	46,218	.....	8,097	11,356	12,900	20,435
Union Pacific.....	3,615	4,139,962	934,800	5,567,557	711,643	629,236	91,372	1,201,847	75,177	118,167	1,119,119	2,555,857	320,565	
Union R. R. of Baltimore.....	9	126,661	25,471	153,971	12,599	12,599	112,118	100,022	1,201,847	2,808	1,434,463	6,230	128,232	
Union R. R. of Pennsylvania.....	31	702,771	227,842	1,030,635	150,572	186,809	21,022	365,422	12,644	1,201,847	1,467	1,422	1,379,963	
Vandalia, Shreveport & Pacific.....	171	71,336	40,989	126,046	20,578	23,914	3,573	49,378	2,624	20,578	27,295	2,720	27,718	
Virginia & Southwestern.....	240	146,322	16,920	167,271	24,720	2,808	47,322	1,201,847	75,177	118,167	1,119,119	2,555,857	320,565	
Virginia.....	503	507,694	39,244	577,786	68,030	94,130	5,588	116,906	10,500	1,201,847	1,467	1,422	1,379,963	
Walash.....	2,518	1,811,323	602,551	2,647,733	292,604	455,222	80,735	975,683	17,187	1,201,847	1,467	1,422	1,379,963	
Washington Southern.....	356	33,043	40,818	1,030,635	150,572	186,809	21,022	365,422	12,644	1,201,847	1,467	1,422	1,379,963	
Western Maryland.....	661	593,851	97,936	724,690	106,809	119,472	24,720	2,808	47,322	1,201,847	75,177	118,167	1,119,119	
Western Ry. of Alabama.....	943	448,165	117,886	596,988	142,691	61,020	21,434	271,501	2,076	19,787	53,9,54	18,069	1,119,119	
Wheeler & Lake Erie.....	133	61,450	38,209	109,007	16,937	20,566	5,659	30,627	1,447	4,253	8,435	18,695	-18,695	
Yazoo & Mississippi Valley.....	459	469,835	53,791	569,727	64,872	105,077	9,074	187,070	1,421	1,201,847	1,467	1,422	1,379,963	
Alabam & Vicksburg.....	143	\$240,657	\$125,660	\$403,249	\$65,649	\$98,118	\$10,897	\$146,559	\$9,840	\$16,608	\$347,671	\$55,578	\$33,858	
Alabama Great Southern.....	309	833,124	326,018	1,286,433	160,169	337,922	40,749	427,664	10,119	27,984	1,004,028	282,026	255,710	
Atchison, Topeka & Santa Fe.....	8,427	16,982,232	6,346,212	25,280,539	3,691,431	4,250,156	485,658	6,803,463	44,054	15,629,124	9,601,415	1,197,380	8,400,215
Atlanta & West Point.....	93	144,252	125,089	306,085	52,085	16,058	94,633	10,437	4,447	13,016	5,136,223	2,375,271	29,961	17,742
Baltimore & Ohio Chicago Terminal.....	80	475,508	178,038	713,899	113,835	129,828	39,836	10,438	30,664	16,878	97,022	43,011	53,790	-38,089
Bangor & Aroostook.....	631	529,411	190,567	873,727	153,391	140,560	8,054	252,051	4,337	28,582	58,976	180,304	26,250	154,049
Atlantic & St. Lawrence.....	167	214,500	106,682	351,381	69,494	48,392	12,088	154,211	8,410	292,594	58,787	32,400	26,387
Atlantic Coast Line.....	4,664	4,393,894	1,986,603	6,938,463	1,339,448	1,474,736	164,815	2,800,001	19,947	23,527	5,976	40,500	382,507	48,554
Baltimore & Ohio—System.....	4,516	19,378,005	4,438,681	25,629,396	2,595,565	4,851,473	485,658	9,300,173	141,911	551,147	17,955,927	7,673,106	6,833,950	-66,070
Baltimore & Ohio Chicago Terminal.....	80	475,508	22,232	43,37,443	49,49,530	65,65,530	2,808	171,338	10,438	14,289	131,903	123,540	55,064	34,846
Boston & Maine.....	2,252	6,922,692	4,897,044	12,884,675	2,100,376	132,822	5,231,752	59,160	277,767	9,940,235	2,944,441	50,731,200	14,049	28,157
Buffalo & Susquehanna R. R. Corporation.....	253	349,740	23,149	821,663	77,276	115,559	1,153,453	1,156,644	37,367	1,75	7,507	32,250	1,411,14	14,679
Buffalo, Rochester & Pittsburgh.....	91	477,594	27,262	821,663	20,165	69,404	261,493	280,015	617,461	815,021	4,183	52,826	1,997,922	-19,713
Carolina, Clinchfield & Ohio.....	248	501,959	57,154	516,439	445,439	646,444	34,109	101,116	10,931	27,239	30,726	42,750	257,941
Carolina, Clinchfield & Ohio Lines.....	137,714	349,889	27,907,219	10,297,298	1,242,486	2,188,737	229,526	111,388	1,638	1,638	1,638	2,437,263	7,353,333	2,735,333
Central of Georgia.....	1,924	1,96,513	939,285	3,13,3,317	480,016	628,892	107,593	1,127,263	4,158	101,292	1,176,929	1,176,929	1,176,929	-11,474,3
Central Vermont.....	678	5,444,900	2,051,877	2,922,694	721,204	96,479	2,474,037	4,141,9	148,033	4,835,023	3,087,071	3,753,333	2,735,333	2,735,333
Charleston & Western Carolina.....	411	682,076	285,290	1,049,353	171,583	165,735	23,601	450,321	9,009	19,546	839,795	42,750	162,278	49,548
Chesapeake & Ohio Lines.....	341	302,026	100,517	425,334	95,873	89,94	12,903	166,729	12,455	377,303	47,351	15,000	32,350
Chicago & Alton.....	2,367	7,923,477	1,772,310	1,242,486	2,188,737	171,354	3,203,136	67,117	210,177	7,083,005	3,214,293	32,766	18,842,294	87,778
Chicago & Eastern Illinois.....	1,033	2,420,948	1,188,759	3,915,854	426,730	829,170	107,063	1,252,477	80,904	1,252,477	1,182,401	134,550	1,047,350	-19,8

Traffic News

The Illinois Central fast freight train between Chicago and New Orleans recently completed a record of 310 days' service in which it arrived at destinations on time.

All the St. Louis railroads, except two, have agreed on a plan for having their city ticket offices in one building, at Broadway and Locust street, but to have separate offices for each road, not a joint office. It is expected to save \$100,000 a year in rentals.

The Traffic Club of New York

The Traffic Club of New York will hold its annual meeting and election of officers at the Hotel Astor, New York, on November 24.

National Industrial Traffic League

The annual meeting of the National Industrial Traffic League was held at Chicago on November 12 and 13.

In his opening address President H. G. Wilson, traffic commissioner of the Traffic Bureau of the Toledo Commerce Club, severely criticized railway men and others for attempting to undermine the present system of railroad regulation, and for "the present veiled attack on the usefulness of the Interstate Commerce Commission," which, he said, "is the culmination of studied effort and purpose on the part of those who would have that body composed of creatures of their own choosing, instead of the conscientious men they are." Following this the league adopted the following resolutions:

"Whereas, regulation of common carriers through the medium of the commerce act, as administered by the Interstate Commerce Commission has been received by many interests in other than a friendly spirit, and

"Whereas, recently much criticism has been indulged in through the public press, and otherwise, of the act and particularly of its administration, therefore be it

"Resolved, that the National Industrial Traffic League, in annual convention assembled, declares its firm belief in the wisdom of governmental regulation and reaffirms its approval thereof; and, while reserving to itself, as well as granting to others, the privilege of recommending such changes in or additions to the commerce act from time to time as may be deemed wise for the best interests of all concerned; it hereby further resolves that it renews its expression of respect for and belief in the ability and integrity of the Interstate Commerce Commission, and is unalterably opposed to any action that would have the effect of repealing the commerce act or influencing unfairly the administration of this act by the Interstate Commerce Commission."

The business session of the league was devoted to the presentation and discussion of committee reports. On the recommendation of the executive committee it was decided to make a fight on tariffs filed recently with the Interstate Commerce Commission by the railroads in Western Trunk Line and Central Freight Association territories, imposing a charge of four cents per hundred pounds for trap car service, and the attorneys of the league were instructed to file a petition with the commission for suspension of the tariff. It was also decided to oppose the tariffs filed by the railways eliminating stop-over privileges, and to oppose the proposed increased demurrage for refrigerator cars loaded with perishable fruit and vegetables. A committee of seven was appointed to negotiate with the carriers to secure a general adoption of the uniform code of storage rules agreed on by the league and representatives of the carriers through the American Railway Association and approved by the Interstate Commerce Commission, but which has not been made effective by all the carriers. There was considerable discussion on a report that the railways in many cases do not promptly furnish copies of new tariffs to the shippers, and that the shippers have difficulty in ascertaining the exact provisions of such tariffs in advance. The president was instructed to confer with the Interstate Commerce Commission to see what steps could be taken to improve the situation.

The league adopted a report of the legislative committee fa-

voring a resolution of the American Bar Association, recommending a congressional commission to codify the interstate commerce laws, and also favoring a recommendation made by the Interstate Commerce Commission that suits under the interstate commerce act shall be brought in the name of the commission instead of the government. The league also endorsed the recommendation made by the National Association of Railway Commissioners urging a standardization of state laws regulating commerce. A plan for a national traffic conference to be held next year at the San Francisco exposition was referred to the executive committee.

The officers of the league were all re-elected for the ensuing year: President, H. G. Wilson, traffic commissioner Traffic Bureau of the Toledo Commerce Club, Toledo, Ohio; vice-president, J. Keavy, commissioner of freight and traffic division Indianapolis Chamber of Commerce; secretary-treasurer, O. F. Bell, traffic manager, Crane Company, Chicago; chairman executive committee, H. C. Barlow, traffic director Chicago Association of Commerce. A. W. McLaren, traffic manager, Morris & Co., was added to the executive committee.

The annual banquet of the league was held on Thursday evening at the Congress hotel. D. P. Chindblom, assistant secretary of the league, spoke on the organization and purposes of the league, with a plea for more extensive co-operation between the railroads and the shippers. William Heath, vice-president of Larkin & Co., of Buffalo, spoke in place of E. E. Clark, of the Interstate Commerce Commission, who had been expected to be present. Walter L. Fisher, ex-secretary of the Interior and a member of the Chicago Railway Terminal Commission, spoke on "Railway Terminals," criticizing the railways of Chicago for un-economical use of some of the most valuable property in the city, and urging some form of co-operation between the railways to secure unified use of the terminals, possibly under one operating company to operate all of the Chicago terminal facilities with a separate charge for terminal service.

Trap Car Charge at Chicago Opposed

The National Industrial Traffic League, through its attorneys, Borders, Walter & Burchmore, has filed with the Interstate Commerce Commission a petition asking the commission to investigate and suspend tariffs filed by the eastern and western railways, imposing a charge for trap car service, as recently reported in the *Railway Age Gazette*. The petition applies especially to the tariffs filed for the Chicago district, but it is stated that supplemental petitions will be filed when the numbers of the other tariffs become known. The term "trap car" is defined in the tariff as follows: "The term 'trap car' is applied to a car placed at an industry and loaded with less-than-carload freight (except perishable freight requiring refrigerator car protection), to be forwarded to a freight station of the road on which the industry is located, for handling of contents, or, at issuing carrier's option, sent to one of its freight stations or transfer points for handling of contents, or, at issuing carrier's option, sent to destination; also a car containing less-than-carload freight forwarded, at issuing carrier's option, from point of origin, or contents handled at a transfer point or freight station and forwarded to an industry."

The petition states that under these tariffs each of the originating or delivering carriers at Chicago will move trap or ferry cars without any charge over the Chicago rate when such trap cars move from or to freight stations on their own lines in the Chicago switching district from or to so-called universal freight stations on foreign lines in the Chicago switching district, provided the freight is received at such freight stations by street vehicles, and provided each trap car contains not less than a minimum aggregate weight of less than carload freight. Charges are provided to be assessed on trap cars when moving to or from industries either situated on the road-haul carrier or off the line of the road-haul carrier. The result is that a shipper having an industry on the Michigan Central, for example, must pay 4 cents per 100 lb. for the movement of a trap car from his plant to the freight house or transfer point of the Michigan Central, the movement from such industry to such transfer point or station being at the expense of the Michigan Central, but without allowance or payment by that company to any other company. On the other hand, in the case of a trap car loaded

at one of the universal freight stations of the Chicago & North Western, for example, and containing the specified minimum weight of less-than-carload freight, such freight having reached said station by street vehicle through public driveway entrance, the Michigan Central will pay the terminal lines the switching charges necessary to move the car to the station or transfer point of the Michigan Central, amounting to a minimum of \$6 per car, and in addition the Michigan Central will perform practically all of the services that it performs in the corresponding case of an industry on its own line, while the freight in such trap car loaded at the North Western freight station will pay no charge in addition to the flat Chicago rate. These facts and others, the petition states, represent serious questions of transportation theory and practice, and involve discriminations that are *prima facie* unjust and undue. The petition also states that these tariffs were filed with the commission by order of the executive officers of the railways, without due consideration and recommendation

of the traffic officials of the railways by whom changes in transportation rates ordinarily are considered and proposed.

Car Surpluses and Shortages

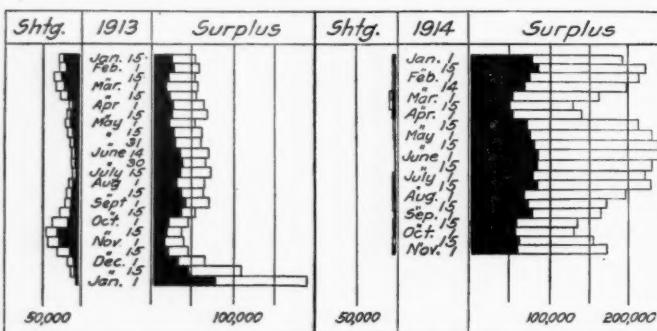
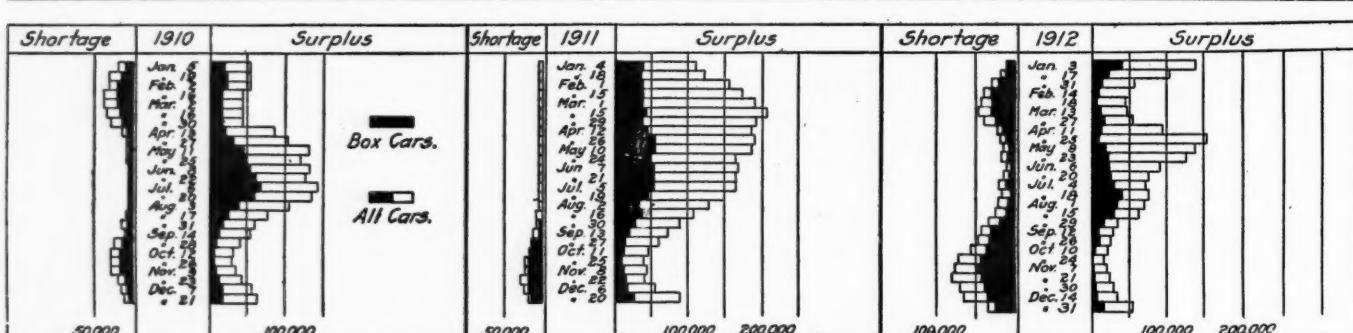
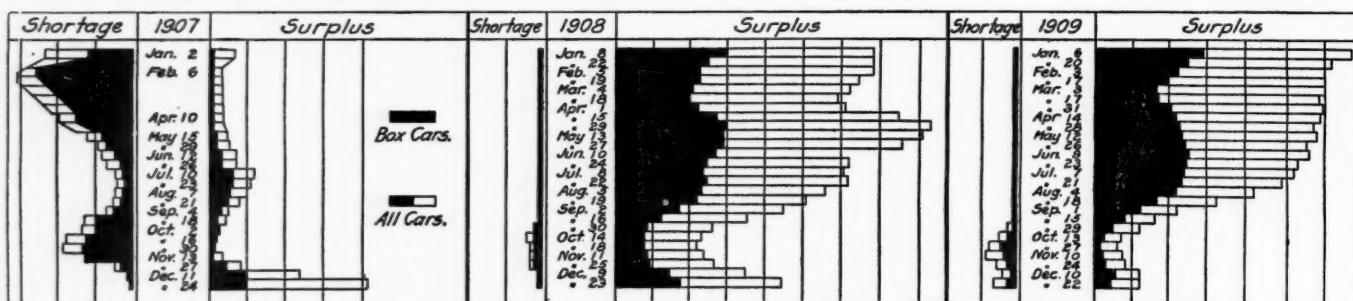
Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 179, giving a summary of car surpluses and shortages by groups from June 30, 1913, to November 1, 1914, says:

There is a further increase in surplus cars of almost 18,000, bringing the total up to 172,325, the largest surplus for the same period in any year since the committee began the publication of these reports, which was in 1907.

The total surplus on November 1, 1914, was 172,325 cars; on October 15, 1914, 154,342 cars; on November 1, 1913, 38,276 cars, and on October 28, 1908, 110,912 cars.

Date	No. of roads.	CAR SURPLUSES AND SHORTAGES				Shortages Coal, gondola and hopper.	Other kinds.	Total.
		Box.	Flat.	and hopper.	Total.			
Group *1.—November 1, 1914	9	0	609	631	550	1,790	591	0
" 2—" " 1, 1914	33	3,053	399	11,131	3,187	17,770	0	0
" 3—" " 1, 1914	28	8,790	2,073	32,532	5,106	48,501	0	4
" 4—" " 1, 1914	12	5,854	1,862	6,904	1,539	16,159	0	10
" 5—" " 1, 1914	23	3,629	1,481	6,339	1,573	13,022	50	0
" 6—" " 1, 1914	28	12,290	1,913	4,773	5,646	24,622	2	7
" 7—" " 1, 1914	4	1,406	33	824	1,057	3,320	0	0
" 8—" " 1, 1914	15	1,337	369	1,535	2,896	6,137	549	9
" 9—" " 1, 1914	13	1,016	254	202	734	2,206	0	3
" 10—" " 1, 1914	22	5,800	1,554	2,748	8,983	19,085	157	42
" 11—" " 1, 1914	5	16,336	1,836	0	1,541	19,713	0	335
Total	192	59,511	12,383	67,619	32,812	172,325	1,349	20
							274	586
								2,229

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1914

The greater part of the surplus increase is in coal cars. This class of equipment increased 11,706 cars in group 3 (Middle) and 5,882 cars in group 2 (Eastern).

Box cars show a heavy decrease in group 6 (Northwest), and smaller decreases in group 8 (Middle Western), group 10 (Pacific), and group 11 (Canada), while a considerable increase is noticeable in group 3 (Middle) and group 5 (Southern).

The total shortage on November 1, 1914, was 2,229 cars; on October 15, 1914, 2,360 cars; on November 1, 1913, 40,118 cars, and on October 28, 1908, 10,839 cars.

There is very little change in the shortage.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1914.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Examiner Kelly held a hearing at Chicago on November 10 on a proposed increase of 25 cents a ton in the rates on anthracite coal from West Virginia points to Chicago. Members of the Chicago Coal Dealers' Association appeared in opposition to the advance.

Examiner Kelley held a hearing at Chicago on November 13, on complaints filed by the Illinois Manufacturers' Association, the Wholesale Grocers' Exchange and the Chicago Association of Commerce against the proposed addition of switching charges to the rates on coal shipments to Chicago, which have heretofore been absorbed.

The commission has issued the following in reference to applications for relief from the assessment of the demurrage charges upon embargoed shipments of live stock, held on account of the quarantine declared to prevent the spread of the foot-and-mouth disease. The commission will be glad to contribute whatever it can toward affording relief at the present juncture. Should the carriers petition this commission to make effective upon one day's notice tariffs which will suspend the assessment and collection of demurrage occasioned by the order of the Department of Agriculture, this commission will be glad to give prompt and favorable consideration to such applications.

Rates on Flour from Inman, Kan.

Enns Milling Company v. Chicago, Rock Island & Pacific et al. Opinion by Commissioner Harlan:

The commission finds that defendants' rates on flour, bran and shorts from Inman, Kan., to various destinations in southwestern Missouri are unreasonable to the extent that they exceed 14½ cents on flour and 13 cents on bran and shorts. A fourth section application for permission to continue lower rates from Hutchinson and McPherson, Kan., is denied, the carriers since the hearing having withdrawn the lower rates to these points. (32 I. C. C., 38.)

Reparation Awarded

George R. Worn et al. v. Boca & Loyalton et al. Opinion by Commissioner McCord:

The commission finds that the carrier discriminated against Boca, Cal., by maintaining from February 20 to November 7, 1910, a rate of \$1 per ton on dry lumber from Star, Cal., to Boca on traffic destined to Truckee, Cal., while maintaining a rate of \$1.50 per ton from Star to Boca, applicable on traffic to Verdi, Nev., and other interstate points. The present rate of \$1.50 from Star to Boca, however, is not found unreasonable nor discriminatory, as it is applicable on all traffic irrespective of destination. Reparation awarded. (32 I. C. C., 58.)

Rates on Potatoes to Independence and Coffeyville, Kans.

Kansas Wholesale Grocery Company, et al. v. Ahnapee & Western, et al. Opinion by Commissioner Meyer:

The commission finds that a rate of 35 cents per 100 lb. on potatoes from producing territory in Wisconsin, Minnesota and Michigan to Independence and Coffeyville, Kans., is prejudicial to the two latter points as compared with the rate to Chanute, Kans., and Bartlesville, Okla., and other Kansas and Oklahoma points, in so far as it exceeds the rate to Pittsburg, Chanute and Parsons, Kan., by more than 1½ cents. It is also held that the rate to Coffeyville should not in any case exceed the rate to Bartlesville, Okla. (32 I. C. C., 139.)

Cement Rates from Mitchell, Ind.

Opinion by Commissioner Clark:

The commission finds that a rate of 11 cents per 100 lb. on cement from Mitchell, Ind., to Memphis, Tenn., established by a note to a tariff excepting Michell from the application of a group rate of 14 cents as to shipments to Memphis was not cancelled by a supplement to the tariff, which merely transferred

Mitchell to a group taking a rate of 9 cents. The commission also finds that the carriers have justified a proposed increase in a rate on cement from Mitchell to New Orleans and New Orleans group points. (32 I. C. C., 93.)

Refrigeration Rates from Kenner, La.

Kenner Truck Farmers' Association v. Illinois Central et al. Opinion by Commissioner McCord:

The commission finds that the Illinois Central's practice of permitting shippers of fruit and vegetables from New Orleans to ice their own cars if they so choose, while denying a like privilege to shippers from Kenner and other Louisiana points on defendant's line north of New Orleans is not discriminatory. It is also found that the carrier has justified certain increased charges for icing shipments from New Orleans and points north thereof to Chicago. In the same case reparation is awarded on a shipment of vegetables from Kenner, La., to Chicago, which moved via New Orleans and was charged the combination of rates on that point. (32 I. C. C., 1.)

Grain Rates from St. Paul, Minn.

Opinion by the commission:

The commission finds that the carriers have justified a proposed cancellation of joint rates on grain from stations on the Great Northern in Minnesota and Iowa to Kansas City, Mo., and points in Missouri, Kansas, Oklahoma and Colorado. The rates in question apply to Kansas City via a three line haul over the Great Northern to Sioux City, Ia.; the Chicago, Burlington & Quincy to St. Joseph; and the Atchison, Topeka & Santa Fe beyond; or to the other points via the Great Northern to Sioux City; the Chicago, Burlington & Quincy to St. Joseph or Kansas City, and the Atchison, Topeka & Santa Fe, the Missouri, Kansas & Texas or the St. Louis & San Francisco beyond. The commission holds that the rates via these routes are relatively lower than the rates from the producing territory in Nebraska to Chicago, whereas there is no necessity for such low rates. There will also still be in effect rates via the Great Northern and the Chicago, Burlington & Quincy which although higher are reasonable. (32 I. C. C., 96.)

Rates on Whiskey from Midway, Ky.

S. J. Greenbaum Company v. Louisville & Nashville et al. Opinion by Commissioner Clark:

It is alleged that the carload and less than carload rates on whiskey and the carload rates on distillers' dried grain, from Midway, Ky., to various destinations and their inbound carload and less than carload rates on bottles, boxes and bottle-carrying boxes from certain points to Midway are unreasonable and discriminatory as compared with the rates to and from Lexington and Louisville, Ky.

Rates on whiskey and distillers' dried grain. The commission finds that the rates on these commodities via the Southern Railway and the Cincinnati, New Orleans & Texas Pacific and their connections from Midway via Cincinnati to points in central freight association territory are not unreasonable or discriminatory.

The following rates, however, are termed discriminatory: Rates on distillers' dried grain and whiskey in carloads from Midway, via the same carriers through Cincinnati to points in trunk line, New England, and Atlantic seaboard territories and rates on whiskey in carloads via Cincinnati to Virginia cities in so far as they exceed the carload rates from Lexington via Cincinnati by more than the following amounts: distillers' dried grain, two cents; whiskey in wood in bulk, three cents; whiskey in glass, packed in barrels or boxes, four cents. The rates over the Louisville & Nashville and its connections on whiskey and distillers' dried grain via Lexington to points in central freight association, New England, trunk line and Atlantic seaboard territories in so far as they exceed the rates from Louisville via Lexington. Rates on whiskey and distillers' dried grain to points in New England, trunk line, and Atlantic seaboard territories when moving through Lexington, in so far as they exceed the rates from Louisville via Lexington. Rates on whiskey to Virginia cities via Lexington in so far as they exceed the rates from Louisville to Virginia cities. Authority to grant lower rates from Louisville and Lexington to points in central freight association, New England, trunk line, or Atlantic seaboard terri-

tories or to Virginia cities on whiskey moving via the Louisville & Nashville from Louisville through Lexington or from Lexington via Louisville than from Midway and other intermediate points is denied.

Rates on bottles, boxes and bottle carrying boxes. The following rates are termed discriminatory: Rates to Midway via Louisville in so far as they exceed the rates via Louisville to Lexington; rates to Midway via Lexington to the extent that they exceed the rates to Louisville via Lexington, and rates to Midway via the Southern and the Cincinnati, New Orleans & Texas Pacific through Cincinnati in so far as they exceed the rates via Cincinnati to Lexington by more than two cents on bottles and three cents on boxes and bottle carrying boxes.

The record does not present a clear basis for fixing less-than-carload rates on whiskey from Midway via Cincinnati, or on bottles, boxes, etc., from the points of origin complained of to Midway via Cincinnati. It is ordered that these rates be brought into proper relation with the carload rates, and also with the less-than-carload rates on whiskey from Lexington via Cincinnati to the same destination, and the rates on bottles, boxes, etc., from the points of origin complained of to Lexington, via Cincinnati. (31 I. C. C., 699.)

Joint Rates With the Birmingham Southern

In the matter of the investigation and suspension of new joint class and commodity rates for the transportation of freight originating at and destined to points on the Birmingham Southern. Opinion by Commissioner Meyer:

In August and September, 1911, the Atlanta, Birmingham & Atlantic filed tariffs naming new joint rates between it and the Birmingham Southern. A complaint has been filed against these schedules by the Louisville & Nashville, the Southern and other carriers, it being alleged that the Birmingham Southern has no right to participate in joint rates and receive divisions thereof, because it is a mere plant facility, and that even if it is a common carrier, the amount of the divisions it would receive under the proposed rates is excessive.

The Birmingham Southern is owned directly by the Tennessee Coal, Iron & Railroad Company. It operates a main line about 43 miles in length and has 85 miles of yard tracks and sidings, most of which are within and about the plant of the Tennessee company. The tonnage of the latter is about 40 per cent of all the traffic originating in the Birmingham district and about 93 per cent of that handled by the Birmingham Southern. The road is the only one of several industrial lines in the Birmingham district that has been incorporated as a common carrier; and it alone makes reports and files its tariffs with the commission.

At the present time for long hauls the trunk lines apply the Birmingham district rate to or from competitive points. At Birmingham, Ensley and Bessemer the trunk lines absorb the switching charges of each other to all industries. At the same points they absorb the switching charges of the Birmingham Southern for deliveries to or from all shippers not affiliated with the Tennessee company, in conformance with a decision of the Alabama Railroad Commission in 1908 which ordered the Birmingham Southern to reduce its switching charge from \$3 per car to \$2, and further ordered the trunk lines to absorb the same. On traffic to and from points on the Birmingham Southern, outside of these switching limits, the charges are the group rates plus the individual rates of the Birmingham Southern. On traffic to or from the plants of the Tennessee company, no absorption of the Birmingham Southern's charges is made at any point.

The commission holds that the Atlanta, Birmingham & Atlantic may properly enter into joint rates with the Birmingham Southern and arrange with it concerning divisions out of the through rate. "If the Birmingham Southern were owned by interests independent of the Tennessee company, the protest of the Louisville & Nashville would probably never have been filed. Generally speaking, the mere fact of ownership should make no difference in the status of a common carrier as such. The record shows that the Birmingham Southern is a common carrier. It is so situated that it can and it does serve the public. The fact that other common carriers can serve the great majority of the industries which the Birmingham Southern seeks to serve can have little or no weight in the consideration of the issues here presented. A railway independently owned and having the pres-

ent and prospective tonnage of the Birmingham Southern would doubtless be looked upon as desirable railway property. The proposed extensions southward, apparently in anticipation of the opening of the Panama Canal, will greatly enhance the strategic importance of its location."

The commission also concludes that a division of 6.5 cents per ton on carload traffic to be paid by the Atlanta, Birmingham & Atlantic to the Birmingham Southern would be just and reasonable. It is held that the carriers should establish a proper relation between the less-than-carload and carload rates. The suspended tariff did not contemplate the payment of more than \$2 per car switching charge on freight originating at Birmingham proper and Bessemer, and it is assumed that no change is contemplated in this respect. The carriers will be expected to re-issue their tariffs, effective within 60 days, modified in accordance with the above views.

In a dissenting opinion Commissioner Harlan states that he is unable to see why the Birmingham Southern should be given different treatment from that accorded to the other railways serving industries in the Birmingham district, and that it is his opinion that the Birmingham Southern like these other railways is no more than a plant facility. He also states: "It seems to me logically to follow from the principle announced that facilities, physically and economically a part of an industrial plant and necessary to its successful operation, when turned over to an incorporated railroad company owned by the industry take on a new relation to it, and that the cost of their operation may then lawfully be transferred from the industry to the trunk line carriers with all the additional advantages and privileges that follow, notwithstanding the resulting discriminations against other industries. In other words, so long as a correct outward form is created the real relation between the industry and its subsidiary railroad company appears not to be open to inquiry. I assume that the manufacturing concerns of the country will not be slow, as the result of the rulings here made, to make the necessary arrangements to relieve themselves of the cost of operating their plant facilities of this character." (32 I. C. C., 110.)

STATE COMMISSIONS

The Illinois Public Utilities Commission has suspended proposed advances in the rates on milk, of approximately five per cent, by the railroads throughout the state.

At the request of the railroads the Texas Railroad Commission has postponed until January 14, 1915, the proposed hearing on the application of the railroad companies for a general advance in freight rates throughout the state. The hearing has been set for December 1.

COURT NEWS

The Court of Appeals of Kentucky has handed down a decision holding that the Louisville & Nashville, in providing only one lavatory in the passenger car assigned to negroes, while it furnishes separate lavatories for males and females in the cars assigned to white passengers, has made no illegal discrimination. In this decision the court reverses a lower court, which had imposed a fine on the railroad company of \$500 for violation of the separate coach law. The decision says that equality of accommodation does not mean identity of accommodation. It appeared that the average number of passengers carried in the negro compartment was much less than the number usually traveling in the white compartment of the car.

Judge Landis of the United States district court for the western district of Illinois at a hearing at Freeport on November 9, denied an appeal from his recent decision ordering Frederick W. Ellis, vice-president of the Armour Car Lines, to answer questions put to him by the Interstate Commerce Commission at a hearing in Chicago last January in connection with its investigation of private car lines, regarding the relations between the car lines and the railroads. Frank B. Kellogg, counsel for Ellis, argued his right to present the entire matter to the United States Supreme Court. Judge Landis decided that no final order could be entered in the case until Ellis is recalled as a witness before the commission. If he persists in his refusal the final order will be entered.

Railway Officers

Executive, Financial, Legal and Accounting

O. L. Dickeson has resigned as president of the White Pass & Yukon, the resignation to take effect about February 1.

E. W. McKenna, vice-president of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been retired.

Harry L. Miller, general freight agent of the Southern Railway at Knoxville, Tenn., has been elected president of the Interstate Railroad, with headquarters at Big Stone Gap, Va., succeeding Daniel B. Wentz, resigned.

The officers of the Shreveport, Alexandria & Southwestern Railway System are now as follows: R. A. Long, president; F. J. Bannister, vice-president; R. S. Davis, second vice-president and general manager in charge of operation and traffic; J. D. Tennant, third vice-president; R. T. Demsey, secretary; P. C. Rickey, general auditor, and W. R. Thurmond, general counsel. The headquarters of the company are at Kansas City, Mo.

Operating

O. S. Jackson, superintendent of motive power of the Chicago, Terre Haute & Southeastern, has been appointed general superintendent, with headquarters at Terre Haute, Ind., succeeding J. C. Muir, deceased.

Fred B. Oren, roadmaster of the Illinois Central at Carbondale, Ill., has been appointed trainmaster of the Peoria and Mattoon districts, with headquarters at Mattoon, Ill., to succeed Roldin A. Brown, resigned.

Walter Tuttle Spencer, whose appointment as superintendent of the Old Colony division of the New York, New Haven & Hartford, with headquarters at Taunton, Mass., has already been announced in these columns, was born on July 5, 1869, and was graduated from Sheffield Scientific School of Yale University in the class of 1890. He began railway work in September 1890, as a rodman on the New York, New Haven & Hartford. From 1892, to 1893, he was transitman and then was appointed division engineer. On September 1, 1914, he was transferred from the engineering department to the operating department and was made trainmaster, with headquarters at Providence, R. I., which position he held at the time of his recent appointment as superintendent of the Old Colony division of the same road, as above noted.

Traffic

C. J. Birchfield has been appointed assistant general advertising agent of the Atchison, Topeka & Santa Fe, with headquarters at Chicago, succeeding N. H. Reed, resigned to engage in other business.

Engineering and Rolling Stock

A. Sturrock has been appointed district master mechanic of the Canadian Pacific, with office at Nelson, B. C., succeeding A. Mallinson.

W. F. Weigman has been appointed general foreman of the car department on the Charleston & Western Carolina, with headquarters at Augusta, Ga.

H. F. Staley, formerly master mechanic of the Carolina, Clinchfield & Ohio at Erwin, Tenn., has been appointed master mechanic of the Boyne City, Gaylord & Alpena, with office at Boyne City, Mich.

H. B. Hayes, master mechanic of the Cincinnati, New Orleans & Texas Pacific at Somerset, Ky., has been transferred to Birmingham, Ala., as master mechanic of the Alabama Great Southern.

Milo M. Backus has been appointed roadmaster of the Springfield division of the Illinois Central, with headquarters at Clinton, Ill., in place of Lewis H. Bond, who has been transferred to Carbondale, Ill., as roadmaster of the St. Louis division, succeeding Fred B. Oren, transferred.

A. G. Kantman, who has resigned as superintendent of machinery of the Nashville, Chattanooga & St. Louis, had been

employed by the Nashville, Chattanooga & St. Louis for some 20 years in various capacities—as mechanical engineer, later as assistant superintendent of machinery, and recently as superintendent of machinery. Mr. Kantman has taken active part in M. C. B. Association affairs, and is for the present at his home at 1916 Adelcia street, Nashville, Tenn., attending to his various private matters.

OBITUARY

George F. Clough, commercial agent of the Lake Shore & Michigan Southern at Cleveland, Ohio, died on November 8, aged 38 years.

James Geddes, assistant to general manager of the Louisville & Nashville since September, 1901, with office at Nashville, Tenn., died in that city on November 13, at the age of 87.

H. A. Jones, who resigned last August as assistant treasurer of the Southern Pacific Company, at San Francisco, Cal., on account of ill health, died recently in San Francisco, at the age of 63.

L. F. Day, formerly vice-president and general manager of the Minneapolis & St. Louis and the Iowa Central, died on November 12 in New York City, aged 56 years. He began railway work in 1885 as clerk in the general freight office of the Texas & St. Louis. From June, 1886, to February, 1887, he was traveling freight and passenger agent for the St. Louis, Arkansas & Texas and its successor, the St. Louis Southwestern, remaining with the latter road until April, 1892, successively as chief clerk general freight office, assistant general freight agent, general freight agent and freight traffic manager. He was chairman of the Southwestern Traffic Association from November, 1893, to June, 1897, and then became general manager of the Minneapolis & St. Louis. In October, 1899, he also was made vice-president of that road, and in June of the following year he was appointed vice-president and general manager also of the Iowa Central. Mr. Day retired from active railway service about five years ago.

RAILWAY CONSTRUCTION IN ITALIAN NORTH AFRICA.—On October 2, 1914, a section of railway was opened to public use between El Maia and Zavia in Tripolitania. This marks the completion of the Tripoli-Zavia division, which, with the exception of the Tripoli-Azizia line, is the longest stretch of track in the colony. The new road is 11 miles long, and the total distance from Tripoli and Zavia is about 31 miles. Construction will now be pushed beyond Zavia to Zuara, a port about 35 miles farther on, and work is so advanced on the section beyond Azizia that it is predicted that by the end of the year the railway will be completed to the foot of the Gharian mountains, about 20 miles beyond Azizia and 70 miles from Tripoli. The greatest engineering difficulties yet met in railway building in this province have been encountered in that region, in consequence of which progress has been much slower than on the line to the west.

THE MADEIRA-MAMORÉ RAILWAY OF BRAZIL.—The Madeira-Mamoré Railway, the Maine corporation, which with its controlling company, the Brazil Railway, has recently been placed in the hands of receivers, has met with difficulties almost from its beginning. The line was built primarily to avoid the danger, delay and expense of portage and transshipment caused by the series of cataracts obstructing the waterway between the town of Santo Antonio on the river Madeira, and Guajaramirim, on the river Mamore. Between these two points cargo—principally consisting of rubber from Bolivia and goods of every description from Europe—had always been carried in *batelones* (large boats manned by a crew of about 15 men carrying paddles) at a cost of many lives and the loss of immense quantities of freight annually. Trains have been running on the line with more or less regularity since early in 1911. The cost of operation, however, has been so great that but little net revenue has been realized. The development of the region served, in addition, has been much slower than was anticipated and there has been no improvement in the steamship service from Europe to Porto Velho, which was depended on to feed the railway. The supplementary river service beyond the railhead has also failed to satisfy expectations. It has been evident that Bolivia could be much more likely to benefit from the operation of the line than Brazil; but it has happened that the Farquhar interests which have been responsible for the operation of the line have withdrawn from their holdings in Bolivia.

Equipment and Supplies

LOCOMOTIVE BUILDING

THE QUEBEC CENTRAL has ordered 2 American type locomotives to be built in its own shops.

THE CENTRAL FE RAILWAY of Cuba has ordered one Mogul type locomotive from the Baldwin Locomotive Works.

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 9 electric freight and 3 electric passenger locomotives from the General Electric Company. (See General News section.)

THE RUSSIAN GOVERNMENT RAILWAYS are said to be considering the purchase of something over 100 locomotives in addition to the 30 reported as ordered last week. This item has not been confirmed.

CAR BUILDING

THE CHILEAN GOVERNMENT is reported to have asked prices on 250 freight cars. This item has not been confirmed.

THE RUSSIAN GOVERNMENT RAILWAYS are said to be in the market for approximately 8,000 freight cars. This item has not been confirmed.

THE SOUTHERN PACIFIC has ordered 24 all-steel interurban cars from the Pressed Steel Car Company for service on the Pacific Electric.

THE LOUISVILLE & NASHVILLE has ordered 8 coaches, 6 baggage cars, 4 combination baggage and mail cars and one dining car body from the American Car and Foundry Company.

THE NATIONAL TRANSCONTINENTAL RAILWAY has ordered 250 50-ton all steel freight cars of the Eastern Car Company, 200 50-ton all-steel flat cars of the Nova Scotia Car Works, and a number of sleeping cars from the Preston Car Company.

RAILWAY SUPPLIES FOR THE SWEDISH RAILWAYS.—The Swedish railway authorities are stated to be preparing a list of the materials which will be required in the course of the next few years, and as soon as it is complete it is intended to place orders with various engineering and other firms to a value of about \$2,000,000. This is being done for the purpose of assisting to keep the various factories of the country running, and so diminishing unemployment.—*The Engineer*.

SCOTTISH RAILWAYS DEFY THE ELEMENTS.—The railway from Dunblane to Oban is liable suddenly to be impeded by large stones dashing down the mountain side. In order to protect the traffic a number of signals are connected to a wire fence alongside the track. In the event of a stone striking the screen and forcing its way through it, the fact of the wires being broken causes the signals to assume the danger position, and, at the same time, starts electric alarm bells ringing in the signal boxes. The Highland Railway goes in largely for "blowers," to prevent snow or sand drifts. The "blowers," which are constructed of galvanized iron, are erected in the cut itself, and not on its edge. Their roofs dip towards the foot of the slopes, thus contracting the orifice through which the snow or sand reaches the rails. This contraction increases the velocity of the wind, or, rather, that of its lower layers, causing it to blow the snow or sand out of the cut before it can settle. The Levens Viaduct, in Morecambe bay, on the Furness Railway, occupies a very exposed position. A train crossing the viaduct during a gale was blown over on its side. A wind pressure gage was then placed in the middle of the viaduct, and so arranged that when it records a pressure of 32 lb. per square foot, electric bells ring in the nearest signal boxes. All traffic across the viaduct is suspended as long as the bells ring, and for a further period of 15 minutes after they have ceased.

Supply Trade News

C. E. Harrison has resigned as co-receiver of the Barney & Smith Car Company, and H. M. Estabrook will continue as sole receiver.

A. L. Moler has been elected vice-president, manager and a director of the Durbin Train Pipe Connector Company, Ltd., Montreal, Que. Mr. Moler has been connected with several large railways as master mechanic and superintendent of motive power in the course of the past 16 years.

J. A. Smythe has been appointed boiler expert of the Lukens Iron & Steel Company, and the Jacobs-Shupert U. S. Firebox Company, with headquarters at Coatesville, Pa., effective November 1. Mr. Smythe was formerly associated with the Parkesburg Iron Company, Parkesburg, Pa., in a similar capacity.

J. Vipond Davies, vice-president of Jacobs & Davis, Inc., consulting engineers, New York, on November 3 was awarded the Telford Gold Medal of the Institution of Civil Engineers of London for his paper on the "Extensions of the Hudson River Tunnels of the Hudson & Manhattan." This medal is the premier medal of the institution and is awarded annually for a paper presented in the minutes of the proceedings of the institution. It dates back to the year 1835, funds for the purpose having been bequeathed by the celebrated engineer Thomas Telford, the first president of the institution.

The representatives of the Sherwin-Williams Company, Cleveland, Ohio, brimful of optimism, are just now getting down to work after the thirty-fourth annual convention of the company held at the Hotel Statler, Cleveland, on November 9-12. Nearly 400 representatives, both traveling and local, attended and listened to talks by their fellow representatives and the department heads concerning the various branches of the company's activities and the successful methods used to get increased business. Particular emphasis was placed on the results of the company's "Forward Again Campaign" instituted last February which has met with splendid success despite the war. The officers and representatives of the company have announced it to be their intention to go forward unhesitatingly with the plans of expansion laid down before the war, an idea well expressed in the president's message to his staff, reading: "We feel confident in the near future that this country will benefit commercially from the sad misfortunes of the great powers now engaged in a life and death struggle. We on this side of the Atlantic not only enjoy the inestimable blessings of peace, but by reason of our abundant harvest and the great demand for our products, a very large section of our population is enjoying unusual prosperity. The financial difficulties resulting from the war and some interference with the shipment of our products abroad are being straightened out, and we believe all who have the courage, the energy and the faith to keep on perseveringly will meet with proper reward."

TRADE PUBLICATIONS

GATE VALVES.—Jenkins Brothers, New York, have issued a folder descriptive of the Jenkins Brothers brass gate valves.

TELEPHONE SWITCHBOARDS.—The Western Electric Company has issued a bulletin in Spanish on Western Electric switchboards for the Central and South American trade.

POWER HAMMERS.—Beaudry & Company, Inc., Boston, Mass., have issued an eight-page booklet illustrating some of the Beaudry power hammers and giving the sizes and dimensions of each.

FOUNDRY CRANES AND EQUIPMENT.—Catalog No. 99 recently issued by the Whiting Foundry Equipment Company, Harvey, Ill., contains illustrations of the cranes, overhead-trolley systems, air hoists, cupolas, cupola charging machines, core ovens, ladles, tumblers and other foundry equipment made by the company. The various machines and appliances illustrated are briefly described and information given concerning the various variations of types which may be supplied.

Railway Construction

ALGOMA CENTRAL & HUDSON BAY.—The line from Oba, Ont., north to Hearst, 50.3 miles, has been opened for operation.

ARKANSAS ROADS.—The A. L. Clark Lumber Company has awarded a contract for the construction of a six-mile railway at Glenwood, Ark., to J. N. George & Son.

ATCHISON, TOPEKA & SANTA FE.—This company has begun the construction of eight coach-washing tracks on the river-front property between Seventh and Ninth streets, at Los Angeles, Cal., with the necessary push tracks and air, steam and water lines. The combined length of the coach tracks will be 11,300 ft. In addition to the construction of these new tracks 810 ft. of old track will be relocated. The embankment for the tracks will require 10,000 cu. yd. of dirt and 9,000 cu. yd. of gravel. This improvement is to be completed by January 1, 1915, and will relieve the congestion caused by the increasing traffic due to the Panama-Pacific Exposition. The work is being done by the company's own forces, and the cost will be approximately \$52,000.

BATTLE CREEK, COLDWATER & SOUTHERN (Electric).—According to press reports work will be started as soon as financial arrangements can be made on a line to connect Battle Creek, Mich., with Girard and Coldwater. T. A. Hilton, president; J. F. Thompsons, vice-president, Girard; E. F. Pangburne, secretary, and A. J. Dorrance, treasurer, Coldwater.

BUTLER COUNTY.—This road has been extended from Linestead, Mo., to Poplar Bluff, one mile.

CALIFORNIA TERMINAL.—Right-of-way is being secured, it is said, for an interurban line to be built from San Rafael, Cal., northeast to Sacramento, about 90 miles, through Marin, Sonoma, Napa, Solano, Yolo and Sacramento counties. C. W. Conlisk, San Francisco, is said to be interested.

CANADIAN PACIFIC.—The line of the Alberta division, formerly operated from Java, Sask., to Prussia, has been extended from Prussia, Sask., northwest to Empress, Alta., 23.3 miles, and a new sub-division called the Bassano sub-division has been opened for business on this division from Empress west to Bassano, 118.3 miles. An extension of the Weybourne extension has been opened for operation from Govanlock, Sask., to Altawan, seven miles. The Winnipeg Beach sub-division has been extended from Gimli, Man., north via Flaxa, Arnes and Jellicoe to Riverton, 25.4 miles.

FORT SMITH, SUBIACO & EASTERN.—This company, which operates a 14-mile line from Paris, Ark., east via Subiaco to Scranton, has surveys made for the extension which was projected last year from Scranton east to Dardanelle, 23.4 miles.

GREAT SOUTHERN.—This company, which operates a 42-mile line from The Dalles, Ore., via Dufur to Friend, has surveys made for building an extension from Friend to Juniper Flats, 29 miles.

GULF, FLORIDA & ALABAMA.—This company has secured funds, it is said, to complete the work on the extension from Broughton, Ala., to Pine Hill, 50 miles. (March 20, p. 703.)

LAKEVILLE HOLDING & DEVELOPMENT COMPANY.—Preliminary surveys are being made by this company, it is said, to build a double track electric line from the terminus of the Dual Rapid Transit Line at Verona, L. I., and Creedmoor east to Lake Success. The plans provide for building a viaduct over the meadows and Flushing creek; also for constructing a bascule bridge. The line may eventually be extended east to Roslyn, in all about 15 miles. W. K. Vanderbilt, Jr., New York, and J. A. Wigmore are said to be interested.

LORAIN, ASHLAND & SOUTHERN.—A new line called the Northern division has been opened for business from Ashland, Ohio, via Ashland Junction north to Lorain, 45.5 miles. (October 2, p. 624.)

MASCOT & WESTERN.—An officer of this company, which was incorporated last summer, writes that the final location is now

being made for a line about 35 miles long, to be built from Kelton, Cochise county, Ariz., the junction point of the El Paso & Southwestern and the Arizona Eastern, north to Mascot, which is just north of Dos Cabezas. The line will be built this coming year. John A. Street, general counsel, 1611 Harris Trust building, Chicago. (July 21, p. 227.)

METOLIUS, PRINEVILLE & EASTERN (Electric).—This company, which was incorporated early this year in the state of Washington with \$500,000 capital to build from Prineville, Ore., northwest to Metolius, about 32 miles, has surveys completed, it is said, and the right of way secured. Definite plans have not yet been decided upon in regard to the construction of the line. H. B. Scheel, Prineville, president. (April 24, p. 966.)

MEXICO NORTH WESTERN.—This company will build a temporary track, it is said, around the tunnel at Cumbre, Mexico, in the Sierra Madres, to expedite traffic while the tunnel is being repaired. This tunnel was wrecked by revolutionists more than a year ago. The proposed line will be about 25 miles long. As soon as the tunnel is reopened through traffic between Juarez and Chihuahua via Pearson and Madera will be resumed.

NORTHAMPTON & HERTFORD.—This company, which operates a 9-mile line from Gumberry, N. C., south to Jackson, is making surveys for an extension to be built from Jackson east to Ahoskie, 30 miles.

PACIFIC, PEACE RIVER & ATHABASKA.—This company, which was organized in Canada, to build from a point on the Pacific coast east to Prince Albert, Sask., about 1,500 miles, has asked the Canadian parliament for authority to build railway lines from tidewater near the head of the Kitimat arm, British Columbia, along Kitimat river, in a northerly direction and via the valley of the Lakelse lake and river to the Skeena river, which is to be crossed by a high level bridge, thence to the valley of the Nass river, near Aiyansh, about 112 miles; also to build a 57-mile line from a point on the Nass river to the summit between the Blackwater river and the Galankest river, thence to the Skeena river, and up the Skeena river to the mouth of Bear river. Pringle, Thompson, Burgess & Cote, Ottawa, Ont., are solicitors for applicants. (April 24, p. 967.)

ST. JOSEPH VALLEY.—A new line has been opened for business from Angola, Ind., to North Metz, 9.8 miles. (December 26, p. 1249.)

TAMPA & GULF COAST.—This company is building with its own forces a branch from Baskin, Fla., west to Indian Rocks, 2.5 miles.

TEXAS ROADS (Electric).—L. M. Hewett and associates of Bryan, Tex., are promoting the construction of an interurban electric loop line from Bryan, south via Independence and William Penn to Navasota, thence north to Bryan, about 45 miles. Connection is to be made at Bryan with the Bryan & Central Texas Interurban.

TEXAS SOUTHERN ELECTRIC.—According to reports from Corpus Christi, Tex., this company has been granted a franchise in Nueces county to build an interurban electric line between Corpus Christi and Bishop, 35 miles. It is said that the company plans to construct a network of interurban railways to connect the different towns in this section of Texas.

RAILWAY STRUCTURES

BROOKLYN, N. Y.—The New York Public Service Commission, First district, is asking for bids until December 1, for the reconstruction of the DeKalb avenue station on the line of the Fourth avenue subway in the borough of Brooklyn. The new work calls for the construction of additional cross-overs and certain station finish work.

DELRAY, MICH.—The Detroit, Toledo & Ironton will build with its own forces, a frame five-stall roundhouse with concrete engine pits, and a frame freight house 20 ft. by 90 ft. in area, and with a platform surface of 2,500 sq. ft., at Delray, Mich. The approximate cost will be \$15,000.

DULUTH, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie has awarded a contract for the grading on the site for its proposed freight house on Twenty-ninth and Superior streets,

Duluth, to Fred Baxter. The estimated yardage is 7,000 cu. yd. The freight house, which will be 24 ft. by 64 ft., will be erected by the company's own forces.

LYNCHBURG, VA.—According to press reports the Chesapeake & Ohio, the Southern Railway, and the Norfolk & Western, have entered into an agreement to build a reinforced concrete viaduct over the James river at Lynchburg. The city of Lynchburg and Amherst county will pay part of the cost of the approaches on both sides of the river and the bridge proper is to be paid for by the railways. The bridge will carry tracks for the operation of street railway cars.

PRINCE GEORGE, B. C.—The Grand Trunk Pacific raised the counterbalance lift section of its bridge across the Frazer river at Prince George for the first time last week to permit steamers to pass up the river. The lift span is 100 ft. long and is raised vertically, a distance of 30 ft. The entire bridge is 2,654 ft. long and has 12 fixed spans and one lift span. A 12-ft. roadway for vehicular traffic is provided on each side.

RUTHERFORD, N. J.—The Erie expects to let contracts early next year for improvements to be carried out at Rutherford, including a new station. There will be an island platform and waiting sheds on the opposite side of the tracks which will be connected with the station proper by a subway. The improvements include the elimination of two grade crossings and the construction of a plaza. All the work, including the grading of streets, surrounding the station is to be carried out by the railway company, and the cost of most of the improvements will be paid jointly by the railway and the town of Rutherford.

ST. CATHARINES, ONT.—An officer of the Grand Trunk writes regarding the report that the company will build a new station at St. Catharines, that the question has been under consideration for some time, but has not progressed beyond the preliminary stage. The company has not yet decided when the work will be carried out. (November 13, p. 925.)

ST. PETERSBURG, FLA.—An officer of the Tampa & Gulf Coast writes that work is now under way on the new passenger station in St. Petersburg. The new building is to be of fireproof construction and will cost about \$20,000. (November 13, p. 925.)

WILKINSBURG, PA.—We are told that the Pennsylvania Railroad will ask for bids early in 1915 for building a new station at Wilkinsburg, near Pittsburgh. The station proper is to be of stone and brick construction, 50 ft. by 100 ft., and will cost about \$60,000. It is to be built at the street level and the railway tracks will be elevated at that point. The station will have baggage and express facilities in the basement to be reached by wagon from the street level and a waiting room, ticket office and other facilities on the ground floor at the street level. There are to be two tunnels or subways under the tracks with elevators for baggage, and stairs to the platforms. The plans call for the construction of two island platforms of concrete, each 30 ft. wide and 1,000 ft. long built to the level of car floors similar to the arrangement at North Philadelphia, with shelters and shelter waiting rooms. The cost of the platforms and shelters will be \$60,000.

WILKESBARRE, PA.—A contract has been given to the Neeld Construction Company, Pittsburgh, Pa., for constructing a bridge over the tracks of the Delaware & Hudson, the Central of New Jersey and the Lehigh Valley from Butler street on Pennsylvania avenue to Kidder street in Wilkesbarre. The improvements will cost about \$87,000. (October 31, page 818.)

GERMAN SOUTH-WEST AFRICA RAILWAYS.—The principal line of railway in German South-West Africa is of 3-ft. 6-in. gage and runs from Swakopmund inland via Karibib to a point about 180 miles from the coast. It then turns southward and goes via Windhuk and Keetmanshoop to Seeheim, where it bends coastward, terminating at Luderitzbucht. From Seeheim a branch runs southward to Warmbad. The total length of the line from Swakopmund to Luderitzbucht is 790 miles and of the branch line from Seeheim to Warmbad 139 miles. There is also a narrow gage (2 ft.) line from Swakopmund to Tsumeb, 370 miles, with a branch from Otavi to Grootfontein. The various distances are as follows: Luderitzbucht to Warmbad, 338 miles; Luderitzbucht to Windhuk, 545 miles; Swakopmund to Karibib, 125 miles; Swakopmund to Windhuk, 244 miles, and Warmbad to Windhuk, 484 miles.

Railway Financial News

BALTIMORE & OHIO.—The stockholders have approved the making of a general refunding and improvement mortgage under which bonds can be issued to the amount of \$600,000,000, and have approved of the purchase of the subsidiary lines in Ohio.

John R. Morron has been elected a director, succeeding James Stillman, resigned.

GRAND TRUNK PACIFIC.—A press despatch from Ottawa says that the Grand Trunk Pacific has sold \$6,000,000 of the \$15,000,000 bonds which were guaranteed by the Dominion government last year. This will give sufficient money to carry on its construction work this year.

LIBERTY WHITE RAILROAD.—This road, which runs from McComb City, Miss., to Liberty, 40 miles, has been placed in the hands of a receiver.

MISSOURI PACIFIC.—This company and the St. Louis, Iron Mountain & Southern have sold to Philadelphia bankers \$800,000 5 per cent equipment trust notes maturing semi-annually in the next ten years. The proceeds of the sale are to be used to pay in part for 73 all-steel passenger cars now ready for delivery to the railroad.

SAN ANTONIO & ARANSAS PASS.—This company, operating 724 miles of road in Texas, earned in the fiscal year ended June 30, 1914, \$4,648,000, a decrease, as compared with 1913, of \$461,000. Operating expenses amounted to \$3,985,000 in 1914, an increase of \$209,000. After the payment of expenses, taxes and interest charges the company had a deficit of \$391,000 in 1914 as compared with a surplus in 1913 of \$203,000. Operating revenues were seriously affected by the floods and extraordinary rains and washouts that occurred in Texas last year and operating expenses were very much increased from these same causes.

The San Antonio & Aransas Pass, or Sap, as it is spoken of locally, lies wholly within the state of Texas. Its main line runs from San Antonio to Aransas Pass, and it has in addition lines running from Waco to Kennedy on the main line about half way between San Antonio and Aransas Pass, and from Houston to Kennedy. The total quantity of freight carried in 1914 amounted to 1,369,000 tons, which is less by 5 per cent than the tonnage in 1913. Of the total tonnage carried in 1914, stone, sand, etc., furnished 13.76 per cent, lumber and other forest products 13.09 per cent, merchandise 8.44 per cent, cotton and cotton seed 14.00 per cent, and livestock 5.56 per cent. A little less than half of the total traffic carried originates on the line, and the principal decreases were in the tonnage of lumber and other forest products and in the tonnage of fruit and vegetables and of cotton seed. The average length of haul was 135 miles, a decrease of 5.41 per cent from the average in 1913. The average revenue per ton per mile was 1.613 cents, a slight decrease from the previous year. The average trainload in 1914 was 226 tons, an increase over the previous year of 6 tons, or nearly 3 per cent. The total number of passengers carried in 1914 was 1,292,000, a decrease of 1.65 per cent, the average length of journey being 43 miles, almost exactly the same as in the previous year. The average revenue per passenger per mile was 2.420 cents, a decrease of 3.35 per cent.

The Sap had at the end of the year a total of \$25,700,000 capital securities outstanding, of which \$1,000,000 was stock and the remainder bonds and notes. This is at the rate of \$35.497 per mile. There was on hand at the end of the year \$159,000 cash, which is less by \$416,000 than the cash on hand at the beginning of the year. There were no loans and bills payable, and total working assets amounted to \$810,000.

TORONTO, HAMILTON & BUFFALO.—This company has made an application to the Canadian railway commission for permission to merge with it the Erie & Ontario. The main line of the Toronto, Hamilton & Buffalo runs from Waterford, Ont., to Welland Junction, with some branches, making a total of 92 miles.